THE INVASION OF THE HUMAN BODY BY THE BACILLUS COLI COMMUNIS,

Pathological Effects, Etiology,

Clinical Symptoms and Treatment,

THESIS FOR M.D. DEGREE,

by

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THE BACILLUS COLI COMMUNIS.

EXPLANATORY NOTE.

OBJECT OF THESIS.

My aim in writing this Thesis is to draw attention to the fact that the Bacillus Coli Communis is found in the urine more frequently than has hitherto been supposed, and its presence there is indicative of a pathological state of the body.

As more is known and studied it will no doubt be possible to describe an infection of the Bacillus Coli Communis as a definite clinical entity, and many diseases described to-day under separate headings may one day be described as a stage or phase of a Bacilli Coli Septicaemia or Toxcmia, Acute or Chronic.

The Bacillus Coli Communis is found in the urine either in pure culture or in association with one or more organisms, but is predominant. In the latter mixed infections it is difficult to judge whether the pathogenicity of the Bacillus Coli Communis is increased or diminished when so associated. One feels that evidence points to an increase of virulence when so associated.

In many cases of:-

(1) Nephritis, or Bright's Disease in various forms, the

Bacillus Coli Communis is so frequently found that one thinks that at a subsequent date we may regard Nephritis as describing one of the stages of a chronic Bacillus Coli Communis infection.

(2) Pyelo-nephritis one regards as being almost invariably associated with Bacillus Coli Communis, with also presence of Calculi.

(3) Even in Tuberculosis of the Genito-Urinary Tract this organism is so frequently found associated that one ventures to wonder which had the priority. Did the Bacillus Coli Communis by its presence and toxins produce the necessary stage to permit of the second invasion by the Tubercle Bacillus ?

(4) Attention will also be drawn to cases apparently not associated with any clinical symptoms of Genito-Urinary diseases other than the presence of the Bacillus Coli Communis in the urine as evidenced by (a) Generalised infections, (b) Toxemia as seen in the Eye Cases quoted.

One proposition will be maintained, i.e. that the presence of the Bacillus Coli Communis is indicative of a pathological state, and that in normal healthy individuals there should not be any micro-organisms present in the urine.

The majority of the cases quoted are of a specific genito-urinary infection.

INTRODUCTION.

It is important that one should be on the look-out for the Bacillus Coli Communis in the urine, because it may give rise to grave constitutional symptoms without any local manifestations, this is particularly the case with children, but it may also occur in adults.

The Urine is nearly always acid. I have been able to demonstrate Bacillus Coli Communis in an alkaline urine, particularly in old people with a long-standing infection.

Odour, foetid to fish-like.

Colour. The liquid varies in clearness, from a pale light yellow to a dark amber opalescent solution.

Acidity. Usually acid. It is stated that B.C.C. grows best in an acid medium.

Sp. G. varies.

Albumen is frequently present, from a mere trace to an estimable quantity. This is due to the pus present.

Blood. If the infection is at all severe or chronic, blood may be present. It usually comes from the bladder.

Microscope. Shews numerous pus cells or a very few micro-

organisms in an average mild infection teem in the field. They are actively mobile.

Culture. Forms gas, indol, and curdles milk , and they are easily grown in gelatine, broth etc.

HISTORY OF THE BACILLUS COLI.

1881. W. Roberts first described a Urine teeming with micro-organisms due to the B.C.C. in 1881.

British Medical Journal, Vol. II., pp.359-623

1885. Escherich described the B.C.C. as a harmless inhabitant of the alimentary canal.

1887. Javel of Berne reported in the British Medical Journal, Vol. II, p. 1187, a case of "Infection of a Goitre Wound with B.C.C.

1889. Albanan recognised Haemic Infection of Kidney with B.C.C. and described a Parenchymatous Nephritis and multiple abscesses due to B.C.C.

1891. Wurtz (Archiv de Medecine Experimental 1893) was able to prove the occasional causal agency of the organism in the following cases:-

(1) Cholera Nostras, (2) Peritonitis, (3) Angio-cholitis and cholangitis, (4) Cystitis, (5) Various pulmonary diseases including pleurisy and broncho-pneumonia, (6) Endocarditis, (7) Meningitis, (8) Arthritis and Pancreatitis.

1891 Welch (Internat.Journal of Med. Science, 1891) p. 443 et seq. on Pancreatitis.

1892 Rebland (Congress of Chirurgery, 1892) recorded five cases of Pregnancy Pyclitis.

1894 Krogius of, Helsingfors (Annal des Origines - Genito-Urinary) on B.C.C.

1894 Gilbert and Leon (Revue de Medecin 1894, p. 449) on B.C.C

1894 Robert Muirhead (Practitioner,1895, p. 594) writes thus:-

"Within the last few years much study has been directed to the changes produced in the nervous system by the injection of bacteria or their products. Paralytic phenomena accompanied by lesions in the spinal cord have been found in animals by a considerable number of observers after inoculation with B.C.C., the typhoid, staphylococcus, aurus and albus. The observations by Gilbert and Leon on the lesions produced by the first (B.C.C.) mentioned organisms, are confirmed in an important paper by Theinat and Masselin (Revue de Medecine, 1894, p.449)

1894 Sittmar and Barlov (Archiv fur Klein Med. Bd. 52, heft 3) reported a case of general B.C.C. septicemia following a local infection of the urethia. The B.C.C. was found in the blood during life.

1895 Vidal and Bezancon (Annal de Pasteur Institut, 1895) consider they throw considerable light on forms of myelitis following acute infectious diseases, many of which are at some period of their course associated with the presence of streptococci. Lesions after streptococcal infection were of the type of parenchymatosis degeneration. No organisms were found in the affected cords, and they consider degeneration was due to action of the microbic products on the most highly developed elements.

Paralysis was most marked in the posterior limbs, and was attended sometimes with flaccidity and sometimes with contracture.

1895 Suredez reported a case of general infection with B.C.C. during an attack of Influenza, in which the B.C.C. was obtained from the spleen during life.

1896 Hogge (Annal de la Soc. Med. Chirurgie de Liege, April 1896, p. 147 and also July 5th, Nov. 1st 1896), describing some Autopsies.

And Macaigne early recognised haemic infection of the kidney with B.C.C. and described an ordinary parenchymatous nephritis and multiple miliary abscess due to this cause (B.C.C.)

1897 B.C.C. described as causing Otitis Media, Conjunctivitis and many other conditions (Ergbuisse der Path. und Path. Anat. 1897.

1898 (Abstract from "Practitioner", 1898.)

Schenk describes a new case of General Peritonitis due to presence of B.C.C. and streptococci in "Cause of Puerperal Fever, "and quotes Frankel with two cases of Puerperal Peritonitis due to B.C.C.; and Budin described Septicemia following Abortion, in which pure culture of B.C.C. were obtained from the Peritoneum, peri- uterine abscess and from the blood. He (Budin) also reported that B.C.C. septicemia occurred five times out of 179 cases. Other authors found B.C.C. once in eleven cases, and seven times in 21 cases.

1898 As causing Mastitis (Ergebnisse der Path. und Path. Anat. Lutarch and Gestertag).

Jensen (B. Coli als Krankheit Erreger bei Tieren).

1898 Sydney Martin in "Lancet" 1898; It says:-

"In some of these cases in which the organism acts as a pus-producer, some at least of the symptoms from which the patient suffers must be regarded as being of a sapyemic nature, due to the absorption of the B.C.C. Toxins, for that it is capable of producing powerfully poisonous substances has been shewn by Sydney Martin."

1899 Cader gave an excellent review of Pregnancy Pyelitis in "L'Obstetrique," Vol. IV.

Much investigation has been done at Schauta's Clinic.

1901 Cases reported of Septicemia.

A case reported by Hencher in 1901, in which death resulted from septic ulceration of the Aortic Valves. During life the B.C.C. was isolated in pure culture from the blood in the early stages of the disease, while later on streptococci also appeared. This case was quoted by Koniger. (Histotolog. Ubersuchungen in Endocarditis.)

1901 Kowalowski and Moro (Klein. Therapeut Wochenschrift) reported two fatal cases in children in which the B.C.C. was obtained from the blood during life, and while Colitis was found P.M.

1905 In Autopsies only up to 1905 the B.C.C. had been found in the blood. Gilman Moorhead, "Practitioner," 1905.

During the past 15 years (up to 1901) B.C.C. has been frequently found in abdominal organs post mortem, and also but less frequently, in the cardiac blood, and according to opinions held in regard to the significance of this fact, bacteriologists may be divided into the following groups:-

(1) Those who believe that the organisms first gain entrance to the body during the so-called agonal period which immediately preceeds death, and

(2) Those who believe that the B. Coli may invade the body during life either through the diseased or healthy intestines, and either itself producing a septicemia modify the course of a previously existing septicemia, or prepare the way for a septicemia to be caused by some other organism.

1909 S. V. Still in his book on Diseases of Children describes Acute Primary Pyelitis in children, and quotes descriptions published by Dr. Holt of New York (one case) and eight cases recorded by Dr. John Thomson (Edinburgh), and a case by Dr. Lankester.

"Fevers of Obscure Origin," Still, 1909.

1910 Professor Klein, (Medical Annual 1910, page 706.) There is an article on Boron Preservatives and their action on B.C.C. etc. and also Dr. Julius Bernstein's experiments.

1910 Wulff, (Presse Med., 1910, Feb. 9), writes on the value of Vaccines in infections of the Urinary Tract with B.C.C.

Billing, (New York State Journal Medicine 1910), on Vaccines in B.C.C. Infections.

1910 A letter by Kenneth Campbell, London W., states among other causes of Iritis, "Gro-alimentary, uterine and tubal infection in 9 % of the cases."

B. M. J. July 1910.

1910. J. L. Bunch M.D., "Treatment of Skin Diseases by Vaccine Therapy," B.M.J., Sept. 24, 1910, describes a case of mixed

infection. Patient with Ulcerating Lupus Vulgaris, treated with X Rays and Tuberculin for six weeks and did not get much better.

Culture shewed Staphylococcal infection. Vaccine injected with Tuberculin. Sent away almost cured. Produced great improvement. At end of two months returned as bad as before. Culture now showed B.C.C., and on being given a B.C.C. Vaccine the Lupus finally cleared up.

The B.C.C. has also been found in a mammary abscess, see Allchin, Section on Skin Diseases.

Articles with Special Reference to Vaccine Therapy have been numerous in the past three or four years: among them and referred to in this paper are:-

1909 "Rebellious Bacterimia," by

John T. Geraghty, M.D.

Transactions of the American Association of Genito-Urinary Surgeons. Vol. IV, 1909.

1909 "The Uses of Coli and Streptococci Vaccines in Urinary Disease," by

Alfred B. Grosse, San Francisco, California.

Transactions of American Association of
Genito-Urinary Surgeons, Vol.IV, 1909.

1909 "Treatment of Sepsis with Bacterial Vaccines,"
Hartwell, Streeter and Green.
Massachusetts General Hospital Number,
No. 2, Vol. III.

1909-10. "A Preliminary Report of Bacterial Therapy in Uretheral and Prostatic Infections."
E. S. Marks.
The American Urological Society, 1909-10.

1909-10. "The Treatment of Infections of the Urinary Tract with Bacterial Vaccines," by
H.F. Hartwell and Edward Streeter,
Path.Lab. Massach. General Hospital,
The Massachusetts Gen. Hospital Number,
No. 2, Vol. III.

1910. "A Report of Results in Certain Forms of Genito-Urinary Diseases Treated by Vaccines."
John H. Cunningham M.D. Bost. and Mass.
Transactions of American Association of
Genito-Urinary Surgeons, Vol.V,1910.

1910 "Values of Vaccines in the Treatment of Infections of the Urinary Tract."

By Hugh Cabot M.D. Boston.

Transactions of American Association Genito-Urinary Surgeons, Vol.V, 1910.

1910. The Vaccine Symposium. "Summary of Results from the use of Vaccines and the Sera of Genococci and other Pyogenic Organisms in Urology."

R. F. O'Neil M.D. Boston and Mass.

Transactions of American Association of Genito-Urinary Surgeons, Vol.V, 1910.

1910. "The Results obtained by Autogenous Vaccines in Various Urinary Infections," by

J. T. Geraghty M.D. Baltimore.

Transactions of American Association of Genito-Urinary Surgeons, Vol.V, 1910.

1910. "A Case of Colon Bacillemia in a Twelve year old Girl,"

by James Pedersen M.D., New York.

Transactions of American Association of Genito-Urinary Surgeons, Vol.V, 1910.

1910. "What we can expect from Vaccines in Puerperal Sepsis," by

J. O. Polak, M.Sc., M.D.

Bulletin Lying-in Hospital, Vol.III. No. 3, Dec. 1910.

1910. "Bacillus Coli Infection of Urinary Tract complicating Pregnancy," by

Napier Burnett, M.B., F.R.C.S.,

Transactions of Edinburgh Obstetrical Society, Vol.XXXVI, 1909-10.

1911. "Puerperal Infection, Its Clinical Varieties and Treatment," by James Harrar M.D.

Bulletin of the Lying-in Hospital, Vol.VII., No.4, March 1911.

1911 "Two Cases of Metastatic Ocular Inflammation associated with B. Coli Toxemia," by

B. Arnold Lawson.

Transactions of the Opthalmological Society of the United Kingdom, 1911.

1912 "Cystitis and Its Causes and Treatment," by

David Newman, M.D. Glasgow.

The Lancet, March 2, 1912.

1910. "Theory of Vaccine Therapy," by

J. G. Taylor,

Practitioner, March 1910.

1910 "Acute Pyelonephritis due to B.C.C." by

H. D. Rolleston.

Practitioner, April 1910, p. 439.

1910 "On Vaccine Therapy," by

Horder.

Practitioner, Sept. 1910, p. 291.

1909 "Acute Infection of the Kidney by B.C.C." by

Garnet Wright.

Practitioner, March 1909 p. 344

1909 "Bacterial Vaccines and Rational Immunisation," by

Hart, B.Sc.

Practitioner, 1909, p. 816

1911 "Infections in the Urinary Tract in Children."

The Universal Record, 1912.

1909. "Vaccine Therapy in General Practice," by

J. C. MacWalters, M.R.C.S. etc.

Practitioner, Sept. 1909.

1910 "Vaccine Treatment of Pyelo-nephritis in Pregnancy," by

Charles F. Routh, M.D. Lond.

B.M.J., Jan. 22, 1910, p. 191.

THE COLON BACILLUS.

PATHOLOGY. (Hector Ou and Reismann)

Soon after birth the intestines of man - and of most, if not all, other mammals,- are occupied by this parasite, which has been found in the intestinal contents of most vertebrates. Both its wide-spread occurrence and its existence in healthy animals suggest that the Colon Bacillus occupies an important part in the animal economy. It seems however that the early development of new-born guinea pigs is not impeded by keeping these organisms out of the bowels; but how far this is applicable to a more prolonged existence, or in man, experimental facts do not show. In a state of health in adults, there can be no question of the usefulness of the intestinal flora in which B.C.C. predominates, as it doubtless aids in digestive operations and contributes to the formation of gas, so necessary to the maintenance of abdominal and thoracic equilibrium. Being so constant, if not indispensable an inhabitant of the intestines of vertebrates, and being evacuated with their faeces, it is not surprising that the members of this group are found widely distributed in nature; and when one considers all the various

vicissitudes to which animal faeces are subject, entailing great changes in the environment of the contained bacteria, the numerous subvarieties of the colon group seem, in part at least, explicable. That members of the colon group of bacteria are subject to wide physiological variation is well known - there being indeed a chain of varieties reaching from the colon to the typhoid group. The extreme so-called typical "colon bacillus" causes fermentation and proteolysis, produces indol and coagulates milk.

Morphologic variation is not striking among the colon bacilli cultivated in the laboratory, but extreme deviation from the rod has been noted of late in careful examinations of organs like the liver, harbouring old colon bacilli of the colon group or recently infected. Here the micro-organisms may appear as long threads, or shorter broken streptococcoid threads, or micro-coccal (diplococcoid) forms, some of extreme minuteness. A failure to recognise atypical formshas undoubtedly led to occasional faulty diagnoses of the bacterial species since the irregularities may persist for several generations in artificial culture media.

Under conditions almost practically unknown to us, at present, the harmless or even useful bacterial mess-mate may become a harmful, deadly enemy, at times apparently beginning its pathogenic activity in the intestinal canal, which constitutes its home. Infantile diarrhoea, diarrhoeal affections in adults, and certain dysenteries may all be due to bacilli of the colon group, at times quite typical, at others more or less atypical. In some of these cases there is little anatomic change, the process being excited by irritating foodstuffs or by perverted and toxic digestive products, which induce a lowered resistance, thus opening a way for the ravages of the bacteria. Under other circumstances, as in the case of appendicitis, strangulated hernia, intussusception etc., mechanic lesions of various kinds may precede the destructive activity of the colon bacilli. Invasion of the gall-bladder and bile-ducts often follows injury from biliary calculi, although it is not positively determined whether bacilli gain access from the bowel or blood. Exogenous infections by these organisms is also possible, as seen occasionally in wound infection. Foods contaminated by colon bacilli from outside sources have been at times found responsible for outbreaks of extensive food poisoning, taking the type both of

an intoxication (botulismus) and of an infection.

BACILLUS COLI AFFECTIONS OF TREES AND PLANTS. The fact that nearly all clinical examinations are made in connection with human beings is apt to obscure the much broader fact that there is a close inter-relationship not only between the maladies of the lower animals and those of man, but also between human and animal infections upon the one hand, and those of plants upon the other. Some very interesting experiments in this connection have recently been carried out by Mr. J.R. Johnston, under the direction of the United States Department of Agriculture (Lancet, Sept. 30th, 1911), and his work has led to the very interesting discovery that the bacillus coli communis, or an organism which it has not hitherto been possible to differentiate from this, is the cause of what is known as bud-rot in the cocoanut palm. Not only were these organisms recovered from affected plants, but repeated inoculations from the cultures made from previously infected plants, and also inoculations from B.C.C. derived from animal sources, produced identical bud-rot phenomena with necrotic changes in the substance of the inoculated cocoanut plants.

Further experiments of this kind will almost certainly in

the future point out ways in which laboratories which were originally founded for the purposes of clinical medicine alone can be most useful also to agriculturists, fruit growers, tree planters, and others who are interested in the diseases that affect plants. Further than this, it seems likely that researches carried on along these lines might very likely elucidate many points concerning human bacteriology that are at the present moment obscure. If the B.C.C. can flourish and multiply in plant tissues, producing well recognised disease, one wonders how many other micro-organisms hitherto regarded as essentially of animal origin may breed and produce illnesses in plants and thereby prove an unsuspected source of infection in man. One knows of vegetable fungi passing from plants to man, in the case for instance of actinomyces and its allies; is it possible that the typhoid bacillus, for example, may produce unsuspected lesions in fruits or plants analogous to those described by Mr. Johnston as being due to B.C.C., thus accounting for those sporadic cases of typhoid fever which have hitherto been so difficult to explain, even when the dangers of typhoid carriers are fully allowed for.

MORBID EFFECTS. An inflammatory reaction, sometimes suppurative, usually attends the advent of pathogenic colon bacilli in the human body. Almost any organ or any sensory surface may be incited to inflammation followed by the production of sero-fibrinous or fibro-purulent exudates. At times the colon bacillus alone plays the role of a pyogenic organism, although in the most severe manifestations of its activity, as in appendicitis and peritonitis, it is often mixed with the pyogenic cocci. It is responsible for many inflammations of the genito-urinary tract, particularly pyelitis, rarely also nephritis. Foecal coagulation necrosis may be produced in spontaneous or artificial infections with this organism. Occasionally in chronic or prolonged irritation with bacilli of the colon group,- occurring for instance in neglected or unrecognised appendicitis - a large amount of new fibrous connective tissue with hyaline degeneration will form, and give rise to the production of more or less localised tumour-like masses occasionally mistaken for true tumours. Abscesses and fistulas may form in such masses. Whether a somewhat similar process, resulting in the production of fibrous tissue in the parenchyma of organs, as in the liver and kidney (cirrhosis), may be induced by the colon bacillus or

its allies (so-called para colon bacilli), is still unsettled, although certain investigations point strongly to this conclusion. An acute and rapidly fatal process taking the form of a septicemia also at times occurs in the course of an acute or sub-acute colon bacillus infection.

INFECTIONS BY B.C.C.

The B.C.C. comprises a group of allied micro-organisms which differ from each other chiefly in the chemical changes they produce upon special media.

Vaccine. It appears that one variety does not protect against another, so that it is particularly necessary to prepare an autogenous vaccine in each case, and to select material which shall contain the particular variety which has become pathogenic.

B.C.C. is prone to infect most areas of the trunk below the diaphragm. Its normal habitat is the Colon, and it is prevented from colonizing into the walls of the large intestine by the protective materials normally present in the blood. Blood is deficient, or a lesion in the bowel wall occurs from other causes, and B.C.C. may invade walls causing various degrees of Colitis. In organs close to the bowels they may

produce secondary infections, such as Coli infection of kidney or bladder; they cause a thickening of the bile and formation of gall stones by the deposition of cholesterin.

This organism also occurs in the stomach, and the recurrent bilious attacks in children, frequently associated with mucus in the faeces (colitis) are probably due to the same cause.

Repeated invasions of B.C.C. may lead to the formation of secondary metastasis in the bones and joints, and in rare cases a general coli infection has been recognised.

The Medical Annual, 1910, page 88.

PATHOLOGY OF B.C.C.

Originally Escherich, 1880, considered that B.C.C. was harmless. Later Javel and Lâng's writings shew that they considered it non-pathogenic, and now another change of opinion has developed, for at the present time (1912) the B.C.C. has come into vogue again as the active factor in many pathologic states.

In 1905 Dudgeon and Sargent in their work "The Bacteriology of Peritonitis," clearly demonstrated the pathogenic influence of B.C.C. and summarised thus: "The B.C.C. plays the greatest

part in hurrying over peritonitis cases from the Wards to the post mortem room."

The B.C.C. is least virulent in the normal bowel, but in diseased conditions of the intestinal canal it is prone to initiate a more or less virulent infection. Dudgeon and Sargent isolated three strains of B.C.C. from a peritoneal exudate of a case of ruptured Typhoid Ulcer, and found that two of them differed, both culturally and in their pathogeneity, to guineapigs.

The B.C.C. Is not infrequently associated with Tubercle of the Genito-Urinary tract.

Rutherford Morrison has long held and taught that these B.C.C. infections, especially if of a chronic type, should be carefully examined and treated for the presence of T.B.

Sydney Martin in his Hunterian lecture, 1909, describes the function of B.C.C. in the intestines as being antagonistic to the putrefactive bacteria.

CULTURE OF B.C.C.

The B.C.C. will grow on the usual culture media, i.e. Glucose-formate-bath, gelatin, milk, and bacillary Agar, and Potato.

It is very easily cultivated, and produces gas, curdles

milk, and turns litmus milk pink with acid reaction.

The acid reaction, gas formation, and Indol production distinguish B.C.C. definitely from B. Typhosus.

VARIATION OF B.C.C. UNDER CULTURE.

Gimbert and Legross (Society of Biology, Dec.22,1900) have endeavoured to modify the characteristics of the B.C.C. by cultivating it on various antiseptic media. Whilst their attempts have been so far successful that out of five cultivations two lost the Indol function, and one the power of forming gas in a medium containing Lactose, and that subsequent cultivations under most favourable conditions did not restore this lost power, nevertheless the loss of power is more apparent than real. Lactose is still slightly decomposed and acid formed, which does not occur with the Eberth's bacillus under similar circumstances.

Pfaundler (Zentrab J. Bacteriol. 1899 Bd.XXIII) concludes his observations on this subject with the assertion that there is no agglutinative action of the serum of a healthy individual from the presence of B.C.C. in the gut, but when the organism is present in the urinary passages then the agglutinative result is positive.

Fehling (Munch m Wochns, 1907 p. 1313) reports a case of B.C.C. pyclonephritis with fever for 14 days ante-partum ; and at delivery cultures from both the maternal and foetal blood were sterile, but a fortnight after delivery the mother's blood diluted 1 in 150 agglutinated B.C.C. isolated from the Patients urine.

AGGLUTINATION OF B.C.C

Courmont and Lesieur have attempted to effect the agglutination of B.C.C. with Typhoid serum and have made observations on the results obtained.with the blood of 25 Typhoid patients. They conclude that typhoid serum, whatever the stage of the disease, and the power of agglutinating Typh.B., does not as a rule agglutinate the B.C.C. If it does so it is in such a feeble degree that there is no relation to its power to agglutinate the Typhoid germ, and no significance can be attached to the reaction, as serum from cases other than Typhoid fever can give a reaction as good and even more marked.

(Practitioner, p. 346, 1901.)

Radjuvky (Centralblatt f. Bacteriologie Bd.XXVI) has also investigated the clumping properties of the B.C.C. He considers that there is no resemblance with regard to agglutina-

tion between the several varieties of the bacillus. In the same gut one finds several varieties which differ in their agglutinating properties. Serum prepared from one variety was effective in clumping several other varieties, the effect being almost specific. Two sera, which apparently had nothing in common with regard to their microbes, can nevertheless agglutinate a third Bacillus to an equal degree. Of a number of Coli varieties, which react similarly as regards their chemical peculiarities, some can be agglutinated by one and the same immunising serum, and others cannot. In fact the phenomena of agglutination point to the existence of a larger number of varieties of bacilli than are at present imagined to exist.

The subject of Serum Agglutination of B.C.C. has been exhaustively reviewed by Coleman and Hastings (American Journal of Med. Sciences, Feb. 1909).

In the tissues the B.C.C. liberates an endotoxin, and in the urinary tract, should there be any degree of retention of urine, these endotoxins are absorbed into the system, setting up constitutional disturbances, and further exciting the formation of bactericidal and agglutinating substances, which are of considerable diagnostic value.

For although the blood is usually sterile, yet in urinary cases it will frequently agglutinate a strain of bacillus taker from the faeces of the patient.

PATHOLOGY OF URINE.

Jean states the microbe commonly found in urine is B.C.C., sometimes Staplylococcus.

Dr. Crowe, Yelverton states he finds that Streptococci are really more commonly associated with B.C.C. than is supposed. He is able by his own method to isolate them, if there, and he finds Streptococci in urine in more cases than the B.C.C. His work has to be confirmed.

The Urine is nearly always acid. I ha ve been able to demonstrate B.C.C. in an alkaline urine, particularly in old people with a long-standing infection.

Odour, foetid to fish-like.

Colour. The liquid varies in clearness from a pale light yellow to a dark amber opalescent solution.

Acidity. Usually acid. It is stated that B.C.C. grows best in an acid medium.

Specific Gravity varies.

Albumen is frequently present, from a mere trace to an

estimable quantity. This is due to the pus present.

Blood. If the infection is at all severe or chronic, blood may be present. It usually comes from the bladder.

Microscope. Shews numerous pus cells or a very few Micro-organisms in an average mild infection teem in the field. They are actively mobile.

Culture. Forms gas, indol, and curdles milk, and they are easily grown in gelatine, broth etc.

Dr. Porter (quoted by Dr. Fordyce, Transactions of Edin. Obst. Society) states that in 19 out of every 20 specimens of urine in females, B.C.C. was present without any symptoms.

This statement I think requires modification. Many patients have possibly no symptoms pointing directly to Urinary tract, but are probably in a state of deficient health and possible general toxemia. The Eye cases and any sudden further lowering of resistance point to this (See also B.C.C. Infection, Lancet, Jan. 6th, 1912).

PHYSIOLOGY AND PATHOLOGY OF URINE.

B.C.C. in Urine (Dixon Mann 1904)

Of recent years attention has been attracted to the fact that B.C.C. are found in the urine and they can be found in

large numbers and produce no symptoms, but on the other hand marked urinary symptoms have been traced to them.

Roberts in 1881 described this condition of Bacterimia.

Two kinds of Bacterimia are described:-

(1) Simple, idiopathic bacterimia in which no other abnormality is discoverable, the micro-organism being B.C.C. This type of Bacterimia is very irregular in duration, it sometimes occurs for a day or two, and then spontaneously disappears, possibly recurring subsequently in a like fugitive manner. On the other hand it may persist for months; the author (Dixon Mann) watched a case for three years, in which bacteria were never known to be absent from urine.

Note. In the subsequent parts of this Thesis I will endeavour to quote some cases shewing pathologic symptoms with no urinary symptoms but pathologic symptoms elsewhere, attributable to presence of B.C.C. in the body. (Physiology and Path. of Urine.)

Since Dixon Mann wrote the above more has come to light, and one would rather say that presence of B.C.C. in urine without urinary symptoms indicates a search for disease elsewhere hitherto unsuspected (See Eye Cases quoted).

(2) Bacterimia that is associated with some pathological condition. In many cases of general diseases, especially if accompanied by profound enfeeblement, bacterimia is common.

Even under these conditions it may come and go in a very erratic fashion, the micro-organism is usually of the B.C.C. group. (Phys. and Path. of Urine, Dixon Mann, 1904)

Dr. J. Graham Forbes (Clin.Path. to Children's Hospital, Great-ormond St.) states that out of 186 cases of Empyema in one case he cultured B.C.C.

CASES OF SINUS SUPPURATION.

B.C.C. has been found in anterior and frontal sinus.

(Suppuration of Accessary Sinuses of Nose, C.J. Lewis M.D. etc., Journal Path., July 1911)

EYE.

B.C.C. has been demonstrated in the Conjunctival sac in cases of Conjunctivitis and in the new-born, though usually the conjunctival sac in these cases is sterile. (See Fuchs, Diseases of the Eye, also Parsons, Pathology of the Eye.)

BLOOD LEUCOCYTOSIS.

Bohland has studied the action of toxins of B. Typhosus and B.C.C. on Leucocytosis. There are a diminished number of Leucocytes in Typhoid blood.

Experiments were made on rabbits and a count made after a fast of 12 hours. A solution of Typhoid toxin was then injected, and counts made at frequent intervals up to an hour after injection. In 8 out of 10 experiments the leucocytes were found to diminish in number in 10-15 minutes, and the lowest point was reached in half an hour. Injections of the products of the B.C.C. caused in eleven cases a hyperleucocytosis, or a result the exact contrary to the Typhoid experiments. It is suggested that here we have another means of distinguishing between these two bacilli. (Bohland, Centralblatt f. Med. April 1899, Practitioner 1899, p.29)

In a B.C.C. infection if at all chronic there are characteristic changes of Second Anaemia. Although in many cases there are strong grounds for suspicion that the B.C.C. infection is a haematogenous one, yet the recovery from the blood is exceedingly rare, in this shewing a parallelism with T.B. This notwithstanding the observations of Rosenberger. (Case of B.C.C. recovered from Sputum, in Lancet, Jan.1, Vol.I, 1912)

EFFECT OF ANTISEPTICS ON B.C.C.

(Medical Annual 1911, p. 706.)

Professor Klein's experiments shew that five per cent Boracic Acid possesses in beef broth a decided inhibitary restraining and disinfecting action on the life and growth of both B.C.C. and B. Gaertner.

Other experiments with (a) sausage meat, (b) veal, pork, broth, also shew that Boracic has a restraining and disinfecting action on the life and growth of B.C.C.

The above results are important as shewing that Boron preservatives have a distinct action upon specific pathogenic organisms inhibiting fermentation (formation of lactic acid), curdling of milk, and souring of cream, and putrefactive(decomposition of proteids with the evolution of malodorous gases) changes.

Dr. Klein's experiments are somewhat contradicted by Dr. Julius Bernstein's, carried out on behalf of the City of Westminster, and dealing specially with the effects produced upon the processes of putrefaction by Boric Acid; and the results may be summarised as follows:-

(1) 20 grs. of Boric acid to the pound have a peculiar

and unequal effect upon the varying processes of putrefaction - the saprophytic organisms (including those producing the odours of putrefaction) being inhibited, but the Coliform group of organisms including Gaertner B. being affected to a much less degree.

(2) Where putrefaction has already commenced Boric Acid (in the same strength, 20 grs. to the pound) inhibits further changes, possibly leading to diminution of any smell that may exist.

(3) The Boric acid has a marked selective activity on the various organisms, inhibiting the growth of yeast and organisms of the proteus group and possibly other harmless saprophytes, though not the organisms of the coli group, In this way stale meat can be used for the making of sausages, and even meat that has already started decomposition, provided it is mixed with Boric acid as a preservative; and if to such meat Gaertner's bacillus has obtained access, it will have had several days at least in which to grow, and what is important, unhindered by the prolific saprophytes.

ETIOLOGY OF B.C.C. INFECTIONS.

SEX.

Commonest in women, especially in connection with pregnancy, but it also occurs in males. It is fairly common in children, especially infants, and apparently it is as common in the male infant as the female, though more females are affected. Mase records 20 cases in male infants and 30 in female.

Analysing the cases quoted in this paper, the predominance of female infection is well supported.

	Male cases	Female cases	
Rolleston records	7	4	
Lawson ...	-	2	
Gilman Moorhead	1	0	
Thomson ...	most females		
Dr. Davy (Exeter)	1		
B. Grosse (America)	2	1	
Hartwell & Streeter	0	24	
Green ...	4	22	
	1	9	
Cunningham ...	3	4	
Cabot ...	13	17	
Geraghty ...	3	0	
" ...	12	12	
Pedersen ...	0	1	
Harrar ...	0	3	
Marks ...	0	10	
Crowe ...	0	3	
" ...	0	- no sex)	3
Author of Thesis	2	15 given)	
Additional	0		2
	49	127	5

These figures will show the greater frequency of the disease in females.

Age. Any age. Infants or old age. Rolleston records a case of a man age 77.

Incidence of Disease. Greatest in pregnant women between 23 and 25 years.

CHILL.

Chill appears to be an antecedent in some cases, but it must be borne in mind that the initial chilliness due to the infection may be regarded as the cause rather than the first symptom of the affection.

PREGNANCY,

is a disposing factor. The Uterus may compress the ureters, especially the R. Ureter, and so favour the infection. (This compression theory of the Uterus the author of this Thesis regards as untenable, in view of the evidence given by anatomical research.)

Further toxemia in pregnancy reduces the bactericidal power of tissues, and so may render the pelvis of the kidney more liable to infection.

Constipation either before or during pregnancy and after parturition may favour the passage of the B.C.C. into the circulation or their passage directly through the intervening tissues and lymphatics to the kidneys.

PYCLITIS

in pregnant women may be due to micro-organisms other than B.C.C., but this organism is most frequently found. (See Pyclitis of Pregnancy, by Ward. 57% were due to B.C.C.)

The period of pregnancy at which most cases occur is the fifth month (Ward).

Pregnancy may light up an acute attack in a patient who has had chronic infection of urinary tract with B.C.C.

In a case recorded by Routh there had been symptoms for 16 years pointing to chronicity of infection.

Doubtless also were it possible to watch through life all the cases in infants, we should get ample evidence to prove the chronicity of this infection, as a review of the cases recorded shews that cases may be apparently cured, but recurrence takes place repeatedly during the life history of the individual with periods of acute acerbations. This view is apparently maintained by Dixon Mann (Physiology of Urine), who states that the B.C.C. disappears and reappears in individuals with or without symptoms.

FOOD POISONING

appears in some instances to have been the cause of B.C.C. infection of the pelvis of the kidney.

It must however be remembered that the initial severe gastro-intestinal symptoms thought to be due to food-poisoning may in reality have been the first evidence of acute colon infection of the kidneys.

Debilitating illness such as Influenza, infantile scurvy (Thomson) has been thought to favour infection by lowering the patient's resistance.

CONSTIPATION AND COLITIS.

Undoubtedly the pathologic state of the alimentary canal will influence the absorption of the B.C.C. into the general system. Evidence has been given under the Pathology section that theB.C.C. in a diseased alimentary canal are capable of producing marked effects. Hence in a Tubercular peritonitis, Enteritis or ordinary so-called Enteritis etc. if one searched one would probably find the B.C.C. associated with T.B. or as the predominant factor.

As the Alimentary Canal is the chief source of B.C.C. the necessity is self-evident of keeping this canal in as healthy a condition as possible.

A few B.C.C. in the urine of a constipated patient may develope and produce the so-called B.C.C. bacterimia.

If some recent work of Conradi is confirmed it would appear that not only certain mucous passages, but also solid organs of the body are in health constantly being invaded by small numbers of micro-organisms, i.e. B.C.C. and streptococci, and that these are constantly being killed. A passage into the tissues of these and other organisms is always proceeding. If this be so are we right in believing that the occasional presence of micro-organisms in urine does not necessarily mean disease, or that we can hope to chase them all away by vaccines?

Harder, "On Vaccine Therapy," "Practitioner," Sept. 1910.

MODE OF INFECTION OF B.C.C.

INTO GENERAL SYSTEM, AND ESPECIALLY GENITO-URINARY TRACT.

Three Ways.

(1) Ascending infection, or the upward extension of the micro-organisms from the urethia to the bladder, ureters and pelvis of kidneys. This method of infection occurs in females, especially in early life, and has been explained by the shortness of the female urethia, and by its liability to be infected from the adjacent anus by faecal discharges and by thread worms. An ascending infection appears to be rare in boys, but an undoubted example of this is its occurrence after circumcision (Moore). In the "Universal Medical Record," 1st number, Jan. 1912, an extract is quoted from a paper by Jeffreys in the "Quarterly Journal of Medicine," April 1911, in which he discusses 122 cases of Infections of Urinary Tract in children. Of these 122 cases 67 were due to Coliform organisms, 37 to Staplylococcus and the remainder to other organisms. The preponderance of female cases suggests that there is an ascending infection from the genitalia especially at the diaper age; this is the more probable because in many cases there has been precedent bowel trouble.

Also in support of the Ascending theory of infection in

B.M.J., March 2nd,1912, a note on "Defloration Pyelitis," Epitome of Current Medical Literature, Section Gynaecology, Widbolz (Corresp. Blatt J. Schweizer Aergte Jan.1,1912) points out the greater frequency of Pyelitis in woman than in man must be due to the greater facilities for infection which the female genitals offer. The relation of pyelitis to pregnancy is now well established, but its relation to defloration has scarcely been recognised. It is so common for newly married women to complain of painful micturition that the physician usually ignores this symptom, and the condition spontaneously disappears; but when the symptoms of pyelitis persist they are frequently attributed to intestinal catarrh, which is a fairly common incident on a honeymoon, or are traced to an influenzal infection of the urinary tract.

Sometimes there are symptoms of violent cystitis which are followed in a few days by unmistakable signs of pyelitis, such as renal pain, pyemia and high fever.

The physician naturally thinks of gonorrhea, but the discharge proves genococci to be absent. That such a slight injury as defloration may cause pyclitis is shewn by 3 cases of Acute Pyelitis in newly married women seen by Wildbolz. In each case nephrectonery had been performed + the urine had subsequently been repeatedly examined, and marriage had been permitted only after it had

become normal and sterile. The pyelitis which flared up directly after marriage was at first attributed to a recurrence of tuberculosis due to the activity of a focus of disease previously latent in the kidney; but the urine was found to contain a pure culture of colon bacillus, which was present in the bladder and the pelvis of the kidney. The patients, whose husbands were innocent of urethritis, made a complete recovery.

In the course of the last few years Widbloz has seen 5 other cases in which painful micturition was complained of by newly married women who had not previously suffered from this condition. In the urine of one a Gram positive-diplococcus was found and in the remainder there was a pure culture of B. C.C. None of the husbands had any urethritis nor was the gonococcus ever found in the patients' urine. Cystoscopy of three of the patients shewed that only the region of the trigonum was inflamed.

The pyelitis was invariably unilateral, being confined to the R. side in 4 cases and to L. in one.

The following case supports Widbolz's contention:- "The wife of a medical man suffered from a severe attack of Right sided pyelitis due to B.C.C. There had been two similar attacks within the last four months, and each had begun with symptoms

of cystitis, which were followed in a few days by fever, violent pain, and swelling of the R. kidney. The patient made a complete recovery, but two weeks later there was another attack with high fever, renal pain, and vesical tenismus. Only the B.C.C. was found in the urine. The husband stated that each attack had been preceded by coitus twenty four hours earlier, and that the patient had suffered from vaginismus. The husband was elderly and on account of ill-health had not co-habited with his wife for five years. On renewal of sexual intercourse, the wife suffered from vaginismus, Kraurosis vulvae, senile atrophy of the vagina, and a tendency on the part of the external genitals to bruise readily.

Whether the infection spread by the ureters, the lymphatics or the blood stream is not certain, but the fact remains that pyelitis followed coitus with striking regularity, and that it never recurred after coitus had been abandoned.

The recognition of defloration and coitus as a cause of pyelitis is most important, as it relieves both the physician and the husband of the embarrasment of a diagnosis of gonorrhea.

It is important that even slight symptoms of cystitis in newly married women should not be igmored, for it may be the starting point of pyelitis gravidarum, which is relatively

common in primipara.

Rovsing has reported 3 cases of pyelitis which he traced to trauma of the Hymen, but with this exception the condition appears to have passed unnoticed in current medical literature.

In adults there may be definite clinical evidence that the infection ascended from the bladder to the kidneys, namely, the onset of symptoms of urethritis and cystitis.

Ascending infection has been disputed on the ground that the bladder and vesical orifices of the ureters may be healthy in cases in which there is pyelitis. Against this it has been urged that organisms may pass up mucous channels by means of ascending currents without any concomitant inflammatory change (Bond).

Ascending infection has been advocated by many writers (Barnard, Dudgeon, Bond and Box), and this route is probably the most frequent path of infection.

The direct infection of the bladder by dirty catheter has only to be cited to be accepted when all the barriers of the vesica and possibly a certain amount of trauma are broken down. The reason for catheterisation, i.e. retention of urine, in itself is a factor, because the bladder has then a lowered resistance to disease.

Colon Cystitis is not a rare event after rectal operations; the organisms may enter per urethram, but are also likely to have entered general circulation from wound.

Attacks of renal inflammation very frequently follow the operation of transplantation of the ureters into the rectum, being often indeed the cause of a fatal termination in such cases, and it would appear to be obvious that, in these circumstances, infection takes place from below, and that B.C.C. is the invading organism.

The sex incidence, and possibly also the curious predilection for the right kidney, are more easily explained on this ground.

Although French was unable to find any evidence of cystitis by cystoscopic examination in his cases, instances undoubtedly do occur in which the clinical history points strongly to an initial inflammation of the bladder. Such a history was elicited by Barnard and Bond in their cases. Again Bond points out, it is not necessary that the lower part of a mucous tract should be affected by an ascending inflammation.

He (Bond) describes a case in which pneumo-coccal peritonitis in a female child was apparently due to ascending infection through genital canal. Pneumo-cocci were recovered from

the vagina, uterine cavity, and Fallopian tubes, and microscopic examination of the tubes after death failed to find any signs of inflammation, although the organisms could be seen lying on and between the epithelial cells.

Microscopic examination of a case, quoted by Garnet Wright, "Acute Infection of the Kidney by B.C.C.," Practitioner, March 1909, shewed that the chief changes took place around the straight tubules, when there was an abundant leucocyte exudation, and in one of Brewer's cases, dilation of the tubules was observed, and Brewer himself says that in this case the microscopical changes suggested an infection from below.

The normal resistance of the bladder (proved by experiment) to infection is known to be very great, and organisms may be abundantly present in vesical urine, without setting up a cystitis, yet capable of infecting the higher urinary field.

Against the Ascending Theory may be observed that there are natural bars to infection in the Vesical Muscles. The Trigone and flap of Ureteral insertion when bladder becomes distended prevents regurgitation into Ureters.

Shober (Annals of Surgery June 1909) quotes certain experiments on animals which demonstrated that the intact bladder

mucosa is non-absorbent, and has a peculiar power of resisting injury and action of pathogenic organisms. From this he deduces that cystitis due to micro-organisms is unknown and that it is always a result of trauma and infection is superadded. Trauma due to an over-distended bladder, from the descent of gravid uterus in early pregnancy, pressure of parturition, and ill fitting pessaries.

Albanan produced cystitis by injecting B. Coli after causing hyperemia of the bladder by ligaturing the urethia.

Rose Bradford (Progressive Medicine Vol.III 1908) quotes Melchior, who found pathogenic organisms in the urethia in 50% of all cases examined and no history of instrumentation.

Relationship between stagnant urine and infection.

Stagnant urine becomes a favourable medium for a growth of bacteria, by whatever route they may have gained access. Retention of urine within the ureter or pelvis of kidney is generally regarded as the initial stage of infection.

Stoeckel verified the existence of such retention in several pregnant patients, whose sole complaint was lumbago, by passing ureteral catheters and drawing off part of urine. An examination of urine proved it sterile.

Albeck (Zeits f. Geb. u. Gyn. 1907 Bd. LX Heft 3) maintains that there is preliminary bacillimia and that such retention is secondary.

HAEMATOGENOUS.

The theory of infection by the blood stream has been very strongly advocated by Brewer and more recently by French, and the former has carried out an experimental investigation on the subject. The animals selected were chiefly rabbits, and the

experiments consisted in the injection of cultures of different organisms after the injury of one kidney, either by bruising with the fingers through a wound, or external blow over the kidney, or by the injection of bismuth into the pelvis, or ligation of the ureter. He found in five experiments, that no marked lesion occurred in either kidney. In the remaining 11 experiments, well marked lesions developed in the injured organ, consisting chiefly of infarets containing suppurating areas, which he regarded as being identical with those observed in his clinical cases. In eight experiments the lesions were unilateral. In the remaining three, they were bilateral, being much more advanced in the injured organ, in two, while in the third, the lesions were practically equal in extent and severity in both kidneys. No lesions occurred in control animals when moderate doses were injected.

From these experiments he concludes that injury of a single kidney, whether produced by trauma, by the presence of a foreign body in the pelvis, or by obstruction of the ureter, is a strong predisposing factor in the production of infection in the organ.

French strongly favours the haematogenous theory of infection in pyclonephritis, and considers that constipation, which

is often associated with pregnancy, favours the passage of the B.C.C. from the alimentary canal into the blood stream. The kidney has been shown to excrete organisms, and this factor, aided by the stagnation of the urine above the obstructed ureter, he holds to explain the infection of the kidney. He points out that the normal valvular action of the ureteric orifice is not interfered with, the obstruction in the ureter being situated at the pelvic brim, and he also states that no evidence of cystitis is forthcoming, and that cystoscopic examination has shewn the bladder to be perfectly healthy. He considers that these two factors are strongly against the ascending infection.

In the Haematogenous or Descending Infection due to the excretion of organisms from the blood into the tubules of the kidney, from experimental observations it is probable that the kidney tissue must be damaged before micro-organisms can pass through it (Sherrington), but this may be done by their toxins, and minute emboli, or may be the result of some existing disease of the kidney such as a calculus, new growth, or nephroptosis. In some cases the isolation of the organism from the blood has been maintained, and thus favours the view that haematogenous infections occur.

Albanan (1889) and Macaigne (1896) early recognised haemic infection of the kidneys with B.C.C. and described an ordinary parenchymatous nephritis and multiple miliary abscesses due to this cause.

It is assumed that the organisms usually gain entrance into the blood stream through some damaged area of the mucous membrane of the bowel. Thus it may follow gastric-enteritis, diarrhoea, and constipation. It has also been suggested that cracks about the anus may be the entrance of B.C.C. into the blood stream (Ritchie and Thomson).

Lockwood (Clinical Journal, Nov.13,1907) notes that in his cases of Acute B.C. Cystitis the majority gave a history of some preceding illness labelled "Influenza," but whatever antecedent cause there is no question that B.C.C. descends from the kidney. Abundant evidence that Typhoid and other pyogenic bacteria can pass through kidney down ureter and affect bladder exists.

French (B.M.J. May 1908) supports the haematogenous theory by the fact that prior to pregnancy there is no urinary complaint, In a large percentage of cases there is no complaint of Cystitis.

Dr. Barbour (Burnett Article in Transactions of Obstetrical Society 1910) in the discussion that followed is reported to have said that according to the observations he had made on anatomical

sections, at no point in its course can the ureter be compressed by the Uterus, if it did this condition would be more frequent in pregnant women than it is.

TRANSPARIETAL.

After parturition, or an infective condition of Peritoneum with or without pus formation the B.C.C. itself wanders through the paralysed wall of the gut into the Peritoneal cavity by means of Lymphatics, and there sets up a condition of profound toxemia. This explains cases of Puerperal trouble in which there is no inflammation of uterus or appendages, or pelvic connective tissue. Therefore antiseptic douching and other local treatment is unnecessary and attention should rather be paid to the Alimentary Canal.

It has also been suggested that the passage of micro-organisms from the colon to the kidney, probably may occur, the mucous membrane of the colon must be damaged so as to allow bacteria to penetrate freely into the wall of the bowel, and so reach the lymphatics, and periodic tissues. There is reason to believe that B.C.C. may pass from the colon to the urinary bladder, and it is logical to assume that bacteria may pass from the colon to the pelvis of the adjacent kidney.

A case of Appendicitis has been quoted which apparently supports this view of direct infection. If an inflamed appendix became adherent to the pelvis of the right kidney it is easy to see how it could be infected.

Mirabeau (Sigmund) (Mun. m. Wohns 1906 N.16) suggests the interesting hypothesis that the proximity of the ascending Colon to the kidney may permit direct transmission of the bacteria via lymphatics from the colon to the kidney, and especially if the latter be at all mobile with occasionally kinking of the ureter. This might also explain why it is that the right is more frequently attacked than the left.

Dr. Barbour in the discussion of Dr. Burnett's paper in the Transactions of Edinburgh Obstetrical Society is quoted as having said that he operated on a case of Acute Peritonitis. On opening the abdomen he found B.C.C. in the contents of the lumen of the Fallopian Tubes, which were congested with evidence of Peritonitis. This case would support either a transparietal infection or an ascending infection from the urethia.

In several cases in our experience in which careful microscopic studies of the stained prostatic secretion failed to reveal any organisms, a bacterimia afterwards developed. Furthermore in a case of nocturnal enuresis in a boy aged 14, in

whom there was practically no development of the prostate, and no sign of inflammation, a mild cystitis developed following light massage.

It is probable in many instances that infection can come directly from the rectal mucosa, possibly from the result of some injury to the mucosa, or through the lymphatics.

Wredin considers that direct penetration of bacteria through the mucous membrane of the rectum can occur. His opinion is based upon a series of experiments made on male rabbits. He injured the rectal mucosa by means of an irritant by scraping off the epithelium; and he found that the rectal lesions provoked a cystitis only when the lesion was situated at the level of the prostate or higher. Lesions lower down had no influence. The organisms found in the bladder were those usually present in the intestines. In certain instances easily recognised bacteria were introduced into the rectum, and these were subsequently recovered in the urine.

His experiments were not conclusive as to whether the infection was through the medium of the prostate or directly from the rectum to the bladder.

Bacterial researches of Notthalft, Young, Stevens and myself (Graphic) have shown that occasionally even when the prostatis is

primarily of Gonnorrhoed origin, secondary invaders may be present in the prostatic secretion. It is not at all improbable that such an infected secretion when forced into the prostatic urethra may be the starting point of a bacterimia or even cystitis. Therefore Geraghty concludes Prostatic massage requires to be done with caution.

(Rebellious Bacterimia, G.T. Geraghty, M.D.

Transactions of American Association of Genito-Urinary Surgeons.)

CAUSATION OF RETENTION OF URINE.

Pressure of Pregnant Uterus.

Anatomy shows three narrow sites of ureters, (1) one at commencement, (2) another at its termination in the bladder, (3) and the third where it crosses the pelvic brim. This last site is the one selected as the place where the pregnant uterus is stated to compress the ureter and cause retention.

Against this is urged that it ought to occur in minor cases and this is rare.

Charles Reed (Guy's Obst. & Gynecol. 1907) sets forth two objections. Reed points out that any pressure sufficient to cause dilation and retention in the ureter above would seriously jeopardise its vitality and lead to formation of ureteral fistulae. Everyone knows what a delicate vascular mechanism the ureter has.

This retention of urine is not recognised as a complication in fibroids where one might think it would occur.

Others suggest ureteral mucosa hypertrophius along with general hypertrophy of bladder, and this acts as a mechanical barrier to overflow.

An insurmountable objection is that B.C.C. infections occur in the non-pregnant state and in children and also in men.

On this point some experimental work is needed.

It is also suggested that there is (1) a deleterious influence on the mucosa of the urinary tract by the excretion from the kidney of some toxic substance at present unrecognised.

(2) That the strain of B.C.C. in pyelitis cases is especially virulent.

EXPERIMENTAL EVIDENCE.

("The Origin of Inflammations in Urinary Tract," Practitioner, page 454, 1894.)

Posner and Luvin contribute a note of some interest in connection with this subject. Most purulent inflammations of the urinary organs are caused by micro-organisms introduced from without, in the majority of cases by means of a catheter. Instances however occur of severe cystitis and pyclonephritis where no such mode of infection is possible. The supposition has been hitherto that it might be derived from the intestinal

canal, and it has been shown that the B.C.C. plays a considerable part. Experimentally a superficial injury to the large Colon has led to cystitis, pointing to a direct passage of bacteria from the intestine to the bladder. The authors endeavoured to solve the question by closing up the anus and at the same time ligaturing the urethia. In all cases micro-organisms were found in the urine, while in stoppage of the urethia alone, the secretion remained absolutely sterile. The organism found was almost always the same gas-forming bacillus belonging to the same group as bacterium coli. The question was then whether the bacteria passed directly from a distended rectum into the bladder. The possibility of this occurring was present, as well marked peritonitis was developed from an intestinal obstruction. Further investigation proved this event to be rare, for they found the bacterium Coli not only within the bladder but in the kidney as well, while the peritoneal fluid between bladder and bowel was sterile. Posner and Luvin hold therefore that under favourable circumstances intestinal micro-organisms can be taken up by the blood and excreted through the kidneys - a process known to be present in certain infectious diseases. They proved this possibility by injecting cultures of the Bacillus Prodiguosus, into

the intestine and finding them in the bile, blood, kidneys and urine. This would furnish an explanation of auto-infection from the intestinal canal showing itself not only as an inflammatory infection of the genito-urinary tract but also in other parts of the body.

(Berlin, Klin. Wochenschr. No. 32, 1894.)

THE INFECTION OF THE RIGHT KIDNEY.

In the majority of cases of genito-urinary infection the right kidney is more frequently affected than the left and it is difficult to explain why!

Albeck reports 52 cases of B.C.C. Pyclitis and of those

the right side was affected in	31 cases,
the left side in	17 cases,
bilateral,	4 cases.

But in many cases both the kidneys may be infected.

Burnett (Transactions of Edinburgh Obstetrical Society, 1910), in all his cases had but one on the right side.

In the cases quoted in this Thesis, the

Right side was affected in 19 cases,

the Left side " 9 "

Bilateral + ? 24/5 " side affected not stated

(1)
The Explanation may be physiological, i.e. that the right side of the body is more used than the left; (2) that it is anatomical, i.e. that the pelvis of the right kidney is situated at a shorter distance from the bladder, in other words that the right Ureter is shorter than the left; also that it is notable that Movable Kidney occurs most frequently on the right side. This view would support the Ascending Theory of infection. (3) The pressure of the pregnant uterus has been suggested, but as my belief is that these so-called B.C.C. infections date from infancy, and as there are many non-pregnant cases and cases in males, this view is not tenable. Anatomical evidence also does not support this view.

Mirabeau (Sigmund) Mun. m Wohns 1906 N.16) suggests the interesting hypothesis that the proximity of the ascending colon to the kidney may permit direct transmission of the bacteria via lymphatics from the colon to the kidney, and especiallly if the latter be at all mobile with occasionally kinking of the Ureter.

Abstract of One hundred + twenty-one Cases from Literature + Eleven Cases Reported by Author

	Disease	Age	Sex	Organisms	Treatment	Authority	Result
I	C.D. Enlarged Prostate Residual Urine Cystitis	80	M	Pure Culture B.C.C. 6 months later a slow growing Streptococci	Autogenous Vaccines New culture every 3 mos 100 million per cc. very 5 day reduced to 50 million + 30 million per cc. Streptococci Vaccine Ordinary Injection of $AgNO_3$	The Uses of B Coli + Streptococci Vaccine in Urinary Disease. J. B. Grosse San Francisco Vol. III 1909 American Genito Urological	Symptoms much relieved Streptococci disappeared after use of Streptococcal Vaccine. B.C.C. persisted $AgNO_3$ irrigation gave no result
2	Dr. L.C. - Enlarged Prostate Cystitis Residual Urine.	72	M	Pure Culture B.C.C.	Autogenous Vaccine B.C.C.	"	Symptoms disappeared rapidly. Residual Urine reduced from 1 3 3 to 1, 3 B.C.C. persisted
3	Mrs P. - Acute Pyelitis	4-K	F	B.C.C.	Vaccine of B.C.C.	"	Acute symptoms subsided. Several weeks treatment Urine Sterile
4	Mrs - Cures 6p for Procidentia Upper end of abdominal Wound septic	42	F	Predominating B.C.C. with Streptococci from pus of wound	Autogenous Vaccine B.C.C 25 million	"Treatment of Sepsis with Bacterial Vaccines" Hartwell Stiles & Green Massachusetts Med Society Number No. 2. Vol. VII Am. Genito-Urologists	Temp normal after 2nd Inject 6. weeks Treatment. Discharged with superficial granulation
5	Mrs - Primipara Puerperal Sepsis (Foot Presentation)	32	F	From Cervix Predominating Streptococci with B.C.C.	Curettage Autogenous Vaccine of Streptococci Repeated Douches	"	6 Inoculations 16th Day T. normal Complete Recovery

Abstract of One hundred & thirty five cases

	Disease	Age	Sex	Organism	Treatment	Authority	Result
66 y	22 Cases Puerperal Sepsis 9 Cases clean infected 2nd 13 Cases dirty from onset	-	-	B.C.C + Staphylococcus Some Streptococci One case Pneumo-coccus	Autogenous Vaccines	Hartwell Stueler + Green (cont)	Improvement in all cases when the wounds had previously remained stationery.
8 9	12 Cases 2 Pelvic Abscesses Drained from 1st. 2 Septic Gall Bladders 3 Appendix Abscesses 2 Nephrectomies 1 Pelvic Abscess opened into Peritoneal through Vagina 2 months after 1st Op		F F	B.C.C. " " " " " " B.C.C. in Pus	Autogenous Vaccines	"	Vaccines not of much use
40.	Mrs S. Pyelitis of Pregnancy (2½ months Pregnant	22, RK.	F	Pure culture of B.C.C in Urine	Ordinary medical treatment up to end of Pregnancy	Burnett "B.C.C Infection of Urinary Tract" Trans. Edin Obstetrical Society. 1909-10	Bacilluria persisted for 2 months Parturition + Puerperium normal
41.	Mrs D. 4th Para 5 months Pregnant Simulated Pleurisy 10th Day Puerperium White Leg	29 RK	F	B.C.C. cultured in Urine	Ordinary Medical Treatment up to end of Pregnancy	"	B.C.C. Persisted Parturition + Puerperium normal except for White Leg 10th day Renal tenderness disappeared

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
42	Mrs M. - Primipara 4th Month Pregnancy Pyelitis Lumbago Attacks of Abdominal Pain + Dysuria.	- R K.	F	B.C.C in pure culture	Auto genous Vaccine Thought to do Nephro-tomy but Abortion came on Ordinary Medical Treatment	Burnett (continued)	Vaccine no use. Abortion of Twins + thereafter acute symptoms subsided. When once during Puerperium treatment was interrupted one day, had a rigor but on giving treatment Puerperium then normal. B.C.C. persisted
43	Mrs S - Primipara 6th month Pregnancy Previously had Acute Cystitis 17 months before. During Pregnancy developed Pyelitis	28 R.K	F	Pure culture of B.C.C. in urine	Medical treatment + attention to bowels until end of Pregnancy	"	Parturition + Puerperium normal. B.C.C. persisted
44.	Chronic Cystitis Frequency Micturition 4. 5 yrs	60 .	F	Pure culture from Urine of B.C.C.	Vaccines 2 mos. Irrigations of Bladder Under pen. Cystoscope Pyuria + injection of neck of Bladder & ureteric orifices appearance	"Treatment of affections of the Urinary Tract with Bacterial Vaccines."	Symptomatically well in 2 mos. In 3 mos was bacteria free Normal bladder in 10 mos. + was symptomatically well, but slight Bacteriuria persisted.
45	Cystitis & Blood 11 years & Intermittent attacks. Sequel to Child Birth Torn Perineum & Cystocele 2nd attack a year later 3rd attack	43 "	F "	Culture B.C.C. 4 year later recurrence Streptococci with. B.C.C B.C.C	Neck of Bladder velvety mucous adherent small areas haemorrhage Ureteric orifices Both Ureters normal Vaccines B.C.C. Vaccine Strepto cocci 6 weeks + then Vaccine B.C.C Vaccine B.C.C	"	4 mos later symptomatically well. Bladder normal except for dilated vessels about neck Both Ureters normal 5 months later symptomatically well Urine Bacteria free B.C. Slight growth still persisted. Well.

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
46	Acute Cystitis for 1 week (Gonorrhoea 3 years before) Frequency	21	M	B. C C.	Bladder injected at base. Vaccines 4½ months Also Lock Ext SO4.	"	Complete symptomatic relief. Bacteria free 15. m. later Symptom well Slight growth of B C C
47	Cystitis 4 months 2nd attack 9 mos later.	23	F	Strepto-cocci for 9 mos. later slight growth of B. C. C.	Diffuse Cystitis R Ureteral orifice red Vaccine Strepto-cocci Bladder Irrigations + Urotropin gave some improvement	"	Bladder normal Ureteral orifices normal Bacteria free After progress slight return of symptoms 9 months later Strepto. cocci, Staphylococci + B. C C. became Bacteria free
48	Cystitis Perineal Operation for Stricture (Death Stricture) + Extravasation of Urine Perineal Fistula for Urine	42	M	B. C. C.	Irrigation + dilation Could not tolerate Urotropin. Vaccine B C C 2 months + then 2nd Course for 8 mos	Hartwell + Stretton	At the end of a month with Vaccines could hold water for 6 hours during day + did not have to rise at night. Treated i Vaccine for 1 yr Whenever Vaccine left off symptoms returned. Will for 6 months 2nd course of Vaccines. B. C C persisted in profuse growths but was symptomatically well + able to do a long journey.

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
49	Cystitis with Renal Calculi + Colic. 9 yrs ago Operated Cystotomy 5 yrs previously Prostatic Enlargement a 2nd Cystotomy Vesical Irritation	60	M	Propure growth of B.C.C. Pus, + Blood In urine 3 months later Streptococci	Vaccines B.C.I. + Urotropin Bladder irrigated every 4 days + then once a week 3 mos later Strepto. Vaccines Bladder generally red + injected Ureteral orifices well marked ridges Trabeculated Bladder Well marked intra vesicular projection of 3rd Lobe No Stones	Kalwell + Steele "	At end of 3½ months with Vaccines could be described as well except for frequency once at night Only 3 oz of Residual urine. Culture slight growth of Streptococci on discharge Urine clear
50	Stricture Urethra Dilated 5 yrs ago Perineal Section again for deep Stricture Drainage Acute Cystitis	52	M	B.C.C.	Foul Urine Urotropin + irrigations Bladder trabeculated with Ulcers at base of Ureters. normal Vaccines B.C.C. Prostate no enlarge	"	Treated for 7 years able to go to work again after course of irrigations Symptoms ~~worse~~ under Vaccines materially improved, but Urine still acid cloudy, with less pus + blood, but culture propure growth of B.C.I.
1	Acute Cystitis + Pyelitis of R. Kidney	35 R.K	F	Propure growth B.C.I	Bladder normal Oedema of Ureteral orifices. Ureters functionating normally after treatment but before Bladder ulcerated + injected. Pus from L. Ureter Irrigation Boracic + Urotropine Vaccines 4 days later	"	Much improvement. Much less pain. Slight growth B.C.C. Urine Bacteria free (Two months after treatment

Abstract (continued)

	Disease dx	Sex	Organism	Treatment	Authority	Result
52	Operation 23 Appendix removed R K for Symptoms of Appendicitis Ch. L. Kidney normal R. Kidney enlarged + uneven surface + distinct nodule above hilus	F	B. C. C. in Urine profuse growth (2) B. C. C. in Urine	Vaccines began after Ch. 1903. R. Ureteral orifice dilated + velvety Left Ureteral orifice normal Stone in bladder. 3 Cystoscope Bladder generally injected. Urine from L. Kidney normal R. Kidney not so	Kahlbell + Steeles	Urine cleared up rapidly Sent to 6. P. D for pain in loin + cystitis + B. C. C. One year later 1903 symptoms markedly well Profuse B. C. C. 2 months later + symptoms again, + pain in R Kidney + cystitis T. 100 - 104° Symptoms subsided 3) Under Vaccines + $CuSO_4$ improved, for 4 months Later. Finally became bacteria free
53	Pyelitis 42 (L. Kidney L. K	F	B. C. C. in profuse growth	Vaccines T. 100 - 102.5 drained each ureteral orifice polypoid excrescences from size of bird shot to duck shot Ureteral orifices normal. Left clear	"	after 13 mos Vaccine became symptomatically well. T fell to normal after 1st injection B. C. C. persisted. Also had $CuSO_4$. Died at another Hosp. after removal of L. Tube + Ovary
54	Pyelitis 21 ileofemoris RK cystitis	F	B. C. C. in Urine	Operation Decapsulation R. Kidney Sweat after Ch. found B. C. C. in Urine Vaccines B. C. C. Ureters normal Pregnant Terminated because of Renal Pyelitis One year later Appendix removed + found diseased Urine normal R. Kidney normal Vaccines stopped. 3 months later similar cystitis symptoms Pregnant. Went to term. R again enlarged + tender	"	B. C. C. more or less always present Vaccines no effect. Treatment by $CuSO_4$ + Urotropin equally futile

Abstract (continued)

	Disease	Age	Sex	Bacteriology	Treatment	Authority	Result
55	Pyelo-Nephritis	32, L.K	F	B.C.C. in Urine	Rest-Cu SO_4 + Vaccines B.C.C.	Hartwell Shiels	After 3 months treatment of Vaccines + Cu SO_4 was symptomatically well. + Urine bacteria free
56	Nephrectomy for abscess Symptoms of Cystitis developed post-Operative 2nd attack 18 months later	L.K	F	B.C.C. at time of Operation from abscess cavity + Bladder Irrigations of Kidney Severe Cystitis treated rest in bed. Vaccines B.C.C. Urine faeces Staphylococci	" B.C.C. + Staphylococci	"	Vaccines B.C.C. + Staphylococci. + irrigations of pus with out abatement of symptoms. Temporarily relieved by rest in bed, + frequent irrigations. B.C.C. disappeared + last culture showed pure staphylococci.
57	Nephrosis	21 R.K	F	B.C.C.	Nephrectomy + drainage of R. Kidney Later Nephrectomy + Vaccines given after Nephrectomy	"	After Nephrectomy Urine became bacteria free, but subsequently a slight B.C.C. persisted
58	Chronic Pyelitis + Cystitis	34 L.K	M	B.C.C. + Staphylococci	Nephrectomy had been done Cystitis developed Irrigations + Urotropin Vaccines B.C.C. + Staphylococci Infection due to Ureteral stump	"	Sometimes B.C.C. + Staphylococci found mixed + sometimes Staphylococci in pure culture. Under Vaccines symptoms improved but B.C.C. persisted
59	Recurrent Pyelitis L. loin for several years	11 L.K	F	B.C.C.	Vaccines + Cu SO_4	"	Vaccines no use. Some attack Renal colic

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
60	Pyelitis + Cystitis (Acute) R. kidney 3 years	10 R.K	F	B. C. C.	Normal bladder Urotropin Rest in bed + Vaccines B C C & S C & S	Hartwell + Shrubs	Rest in bed + irrigations improved temporarily. B. C. & Vaccines no effect on bacteria or numbers.
61.	Deep Urethral Stricture due to Gonorrhoea Generalised Cystitis + Pyelitis of both kidneys	52 B.th K	M	B. C. C. Pure culture from both ureters	B. C. C Vaccines	Cunningham + Report of Genito. Urinary Diseases Treated by Vaccines.	After three mos Vaccines able to resume work as Salesman. Bacillurea persisted No T.B found.
62	Tuberculous of ~~both~~ R. kidney + B. C. C Injection	55 R.K	M.	B. C. C. + Urethral Urine + some Staphylococci	R Vaccine B. C. C. + then Tuberculin	Cunningham + Report of Genito. Urinary Diseases treated by Vaccines	After some 8 months Vaccines ~~alone~~ + Tuberculin improved for a little. Von Pirquet reaction positive. Died of Tuberculous Pneumonia
63	Cystitis (Acute) I had a moderate degree of chronic sclerosis	54	F	B. C. C in Urine Blood agglutinated 1 in 100 B. C. C.	(Clinical for 6 weeks.) General Treatment 2 months no improvement + then Vaccines B. C. C. complicated by Bronchitis	"	10 weeks rest in bed + Vaccines gained control of Bladder + general symptoms improved + Bacillurea persisted but diminished.
64	Cystitis (Acute) Cough + Malaise	29	M	B. C. C in Urine Blood agglutinated 1 in 128	General treatment 2 months no improvement + then B. C. C Vaccines	"	After 1st dose of Vaccine began to improve. Micturition only occurred 4-6 hours. In 2 weeks out of bed, + when discharged pain associated micturition gone but B. C. C. persisted

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
65	Subacute Cystitis	30	F	B.C.C in Urine Serum agglutinates 1 in 128	Vaccines B.C.I	Cunningham	Symptoms nearly well after 3 weeks treatment. Bacteria free
66	Bilateral Tuberculosis of Kidneys R. Nephrectomy Cystitis	47 B.K	F	Urine Pus. T.B + B.C.C agglutinates 1 in 128	Nephrectomy wound did not heal Tuberculin given T. normal in 2 weeks Then B.C.C Vaccines given twice weekly	"	Tuberculin alone for 2 months + no improvement but on giving B.C.I Vaccine as well symptoms improved + Urine became clearer. T.B. + B.C.C. persisted though in lessened number
67	Pyelitis Locomotor Ataxia Had had Gonorrhoea Cystitis onset after Dysentery	24 B.K ? 2, also	M	Pure culture of B.C.C. from Urethral Urine	Large quantities of Water Urethroscopic + bladder irrigations Ureters catheterised	J.T. Geraghty Rebellious Bacteruria Trans of Am. Ass. of Genito Urin Surgeons Vol. IV 1909	Symptoms improved markedly but bacilluria persisted.
68	Infection B.C.C. 2nd to Post Urethritis Cystitis. Gonorrhoea 10 yrs ago for 1st time several times since	32	M	Staphyl. coccus Albus for a few months + then B.C.C. (Has produced cloudiness of Urine	Prostatic massage + irrigations Urine varied to acid & alkaline Ureters catheterised both clear. Vaccines Staphylococcus + B.C.C.	"	Staphylococci V. with no effect for 2 mos. + then B.C.C Vaccine + B.C.C decreased in numbers although they persisted.
69	Cystitis (Chronic) Inflamed Vesical Mucosa	45	M	B.C.C + Staphylococcus Albus in Urine	Catheterisation of Kidneys Urethroscopic irrigations improved but attacks returned Vaccines Staphylococcus Albus + B.C.C mixed Then Staphylococcus alone	J.T. Geraghty Report of the Results obtained by Autogenous Vaccines in Various Affections of Urinary Tract" Trans. Am. Ass. Genit. Urin Surgeons Vol. V 1910	Ordinary treatment some improvement Vaccines mixed or Staphylococcus of no effect. B.C.C alone persisted

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
70	Cystitis	40	M	Pure B.C.C. Urine	Vaccines B.C.C. for 6 months	F.T. Gaughly Results from autogenous Vaccines in genito Urinary Disease	Fluctuations in the disease as before use of Vaccines. Bacteriuria persisted 2 years later
71	Cystitis Post-Urethral	39	M	B.C.C. Urine	Urotropin injections + Urin Vaccines for 3 mos	"	Under ordinary conditions improved Vaccines no effect B.C.C. persisted
72 (a)	Cystitis Injection post-Urethral	38	M	B.C.C. + Micrococcus Urea Urine	Vaccines	"	No effect B.C.C. persisted
72	Cystitis	30	M	Pure Culture B.C.C. Urine	Vaccines	"	3 months of Vaccines No improvement B.C.C. persisted
73	Pyelitis (Pyelo-nephritis) (Double)	32 BR	M	B.C.C. from both Ureters	Urotropin + pelvic lavage of Kidneys several months No effect Vaccines	"	Ordinary treatment no effect Vaccines no effect B.C.C. persisted
74	Pyelo-Nephritis (Double	45 RK	M	B.C.C. Urine	Urotropin + Pelvic lavage No effect	"	Ordinary treatment no effect Vaccines no effect B.C.C. persisted
75	Pyelitis Ectasia Ptosis	? RK 28	M	Pure culture B.C.C. Urine	Vaccines B.C.C. 4 months	"	No effect although symptoms + B.C.C. persisted
76	Pyelitis (Subacute Series of Attacks (Double)	11 BK	F	Pure culture of B.C.C. from both Ureters	Urotropin Catheterism both Ureters Formalin antiseptics general Symptomatic Treatment	Pedersen cleared up case of several years standing in a Twelve year Old Girl. Trans. clin. soc. genito Urin. surgeons Vol V. 1910	Under hygienic measures dietetic & alimentary attention. Child went to school improved in weight Attacks decreased in numbers B.C.C. persisted

	Disease	Age	Sex	Organism	Treatment	Authority	Result
77	Prostatic Infection + Vesicular Secretion	–	M	Gonococci B.C.C + Staphylococci	Vaccine (Emulsion)	C.J. Marks "A Preliminary Report of Bacterial Therapy in Urethral + Prostatic Infections" American Urological Society 1909-10	Good
78	"		M	Gonococci B.C.C +	"	"	Good
79	"			Staphylococcus	"		Good.
80	Cystitis		F	B.C.C + Staphylococci	"	"	Good
81.	Salpingitis (Fallopian Tube)		F	B.C.C + Staphylococci	"	"	Good.
82	Uterine Pus		F	Gonococci + B.C.C	Emulsion	"	No pus 2 days later.
83	Prostatic + Vesicular Pus		M	Gonococci + B.C.C	"	"	Improving
84	Cystitis		M	Gonococci + B.C.C	"		Improving
85	Cystitis (Prostatic)		M	Gonococci + B.C.C	Culture	"	Good
86	Pyelitis (Urinal Pus)	B.K	♀M	B.C.C.	Emulsion	"	Marked benefit
87	Twenty Cases of Puerperal Sepsis		F	B.C.C.	Urotropin + Vaccines B.C.C	J.G. Polak What can we expect from Vaccine in Puerperal Sepsis Bulletin Lying in Hospital Vol VIII. No3 1910	Marked improvement in symptoms Complete recovery after pus evacuated
to 90	3. Cases Post Partum Pyelitis		F	B.C.C	Urotropin + Vaccines B.C.C		Symptomatic cures but B.C.C persisted in Urine
	1. L. Kidney	L.K	F	B.C.C			
	2. L.	L.K	F	B.C.C			
	3. Both	Both	F	B.C.C			

	Disease	Age	Sex	Organism	Treatment	Authority	Result
16 92	2 Cases Caesarian Section Abscess in Pouch of Douglas	-	F F	B. C. C. B. C. C.	Autogenous Vaccines	J. O. Polak	Marked improvement in symptoms Complete recovery after pus evacuated
93 to 100	Acute Primary Pyelitis 8 Cases	14 mos F (8 Cases	F	B. C. C. in Urine	Pol. Ext. grs 20-40 Urotropin	Still (Thomson) Disease of Childhood Dr. Holt. Stills Case	Recovered. Symptomatically well.
101	"	4 mo	dto	B. C. C.	" "	"	Symptomatically well
102	"	Infant	dto	B. C. C.	" "	"	"
103	"	7½ mos	dto	B. C. C.	"	"	"
104	General Septicemia due to B. C. C.	37	dto	B. C. C. recovered post mortem from Blood Urine not tested for B. C. C.	Ordinary Medical Treatment Efforts directed to isolating an organism from Blood	Eyman Moorhead	Illness lasted 126 days. Death
105 Author's Case	Colitis (Several years His boy) Author's Case	37	F	B. C. C. from Stools. No B. C. C. in Urine	Medical Treatment + Vaccine	Watched by Author of Thesis at South Devon + East Cornwall Hospital, Dr. Fosc Physician in Charge	Slight gain in weight. Symptomatically her symptoms were relieved, + she stated the improvement began after Vaccine remained for a long time with out relapse, then with all her previous medical Treatment
106	R Eye Papillitis Retinitis with loss of Vision	21	F	B. C. C. in Urine	Ordinary Medical Treatment of Arnold Rest in bed	Arnold Lawson "Two Cases of Keratitis Ocular Inflammation due to B. C. C. Toxemia" (Transactions of the Ophthalmological Society of United Kingdom 1911)	After two months treatment Vision of Keratitis = 6/12. Later 6/5 easily but there is a blind sector. Many cases to B. C. C. No outline made

Abstract (continued)

	Disease	Sex	Age	Organism	Treatment	Authority	Result
107	Recurrent Vesicular Keratitis	M	36	B. C. C. in Urine	Ordinary Med Treat Scrapings for organism Produced Purulent Discharge + severe condition of eyes Vaccines B. C. G.	Arnold Lawson etc.	Resisted ordinary medical treatment On giving Vaccines response was remarkable + had recovered in both eyes with vision as before illness i.e. R.V. $\frac{6}{9}$ L.V. $\frac{6}{36}$
108	Phlyctenular C. S. (2 years) Conjunctivitis Author's Case	4 1 B. K	F	B. C. C. in Urine	Ordinary Medical treatment + Vaccines B. C. G.	Watched by Author of Thesis at South Devon + East Cornwall Hospital (Dr Fosc Physician in Charge)	Symptoms markedly well + frequency of micturition decreased under Vaccines, when she resisted ordinary medical treatment from 17 times per day + 8-9 times at night to being able to hold water for 2 hrs + only disturbed once or twice at night B. C. G. however persisted
109	Chronic Arthritis Erythema & Dropsy (Incurable) Author's Case	F. B. K	4½	B. C. C. in Urine	Ordinary Med Treat Under hospital Theatre Vaccines B. C. G.	Watched by Author of Thesis at S. D. & E. Hospital (Dr Fosc Physician in Charge)	Under rest in bed frequency of micturition + dropsy decreased Pt early relapsed Vaccines no apparent effect Sent to Workhouse Infirmary as incurable.
110	Chronic Arthritis Dropsy Author's Case	18 B. K	F	B. C. C. in Urine	Ordinary Med Treatment Vaccines B. C. G.	Watched by Author Thesis at S. D. & E. Hosp. (Under Dr Fosc)	Temporary improvement of Pt's in bed + packed + hot air baths. Vaccines apparently no effect. Subsequently died 2 months after leaving Hosp

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
111	Nephritis with Albuminuria Retinitis (Complete failure of Vision) Author's Case	21. (B K)	F	B.C.C. pure culture in Urine	Ordinary Medical Treatment Vaccines B.C.C. Fundi both showed Albuminuric Retinitis & there were beg Hamorrhages into the Vitreous	Related by Author of Thesis at the S.D.+C. Hospital (Under D' [illegible])	Pat improved generally & the slight oedema present disappeared Urine became clearer but B.C.C. persisted Vision was completely gone & with so much damage to structure one could not hope that any treatment would avail.
112	Pyelo Nephritis	2 yrs	?	B.C.C.	Vaccine B.C.C	Rolleston "Acute Pyelonephritis due to B.C.C." Practitioner April 1910 Vol LXXXIV	Symptoms materially relieved.
112	Pyelo-nephritis Illness resembled Enteric Fever No Typhoid found	46 B.K	♂	There was a Colpoin bacillus B.C.C.	P.M. found abscesses in both Kidneys Medical	P. 439 " P. 443.	Pat died
113	Pyelo-Nephritis + Cystitis Left Both Kidney	33 L.K	F	B.C.C. in pure culture from urine	Nephrotomy + drainage of Kidney Multiple Abscesses found	Garnett Wright "Studies in Infections of the Kidney by B.C.C." Practitioner 1909. LXXXII 344.	Three months after onset of illness there was no pus in urine + it was bacteria free (no growth obtained
114	Pyelo-Nephritis + Cystitis (Acute) Both Kidney	13 B.K	F	B.C.C. from Urine, which was slightly alkaline due to Potassium Citrate which was being given	Potassium Citrate	"	Symptoms materially well B.C.C. however persisted

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
115	Pyelo Nephritis associated with Calculi (Renal) Nephrectomy Author's Case	66 L.K	F	B.C.C in pure culture	Ord Medical Treatment Vaccines B.C.C. Nephrectomy	Watched by Author of Theses at the S.D.H. & B.C. Hospital (Physician in charge Dr Sellar)	Medical Treatment + Vaccines no use. Nephrectomy + had made a slow recovery. Urine became Bacteria free
116	Chronic Pyelo Nephritis of Pregnancy (Recurrent) Both Kidneys (4th month of Pregnancy + worst at 7th month)	30 (B.K)	F	B.C.C in Urine	Ordinary Med Treat Urotropen + aspirin Vaccine B.C.C.	Charles Routh "Vaccine in Pyelo. nephritis of Pregnancy B.M.J. Jan. 1910	After use of Vaccine Temperature fell to normal, + their use continued until term. Delivered of a full time female child + 3 week post partum had was well + Urine free from pus + no B.C.C. present
117	Lupus Vulgaris (Tuberculous Ulcerating)	Mb	Found Staphylococcus & then B.C.C.	Tuberculin + Staphylococci Vaccine 1) Then B.C.C. Vaccine	Dr Bunch 'Vaccine in Skin Disease' B.M.J. Sept 24. 1910	Under Tuberculin + Staphylococci Vaccine condition improved but not cured completely Relapsed worse than ever in 2 months. Then found to have B.C.C. + on being given B.C.C + Tuberculin condition healed up completely.
118	Failure of Vision Haemorrhage into Vitreous (B.C.C Toxemia) Both eyes Author's Case	Mb		B.C.C in pure culture in urine urine had no albumen	Medical treatment + Vaccine B.C.C	Watched by Author of Thesis at the Royal Eye Infirmary Plymouth (Surgeon in charge Mr R Walton)	General condition much improved under medical treatment Vaccines given for three doses + then abandoned as the amount of damage done in vitreous gave no hope of patient getting any restoration of vision.

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
119	Sinus Suppuration			B.C.C in Antral & Frontal Sinuses		C.D. Lewis Suppuration of Accessory Sinuses Journal of Bacteriology & Pathology July 1911	
120	Bullous Erysipelas			Strepto-cocci + B.C.C. from pus	Vaccine Strepto-cocci + then B.C.C.	Vaccine Therapy J. McC Walker Practitioner Sept. 1909 P. 327	Streptococci Vaccine improved condition but relapsed. On being given B.C.C Vaccine condition healed up permanently
121	Chronic Ulcer of the Leg			B.C.C. from discharge	Usual Surgical Treatment of no avail. Tried for 2 yrs. B.C.C Vaccine	"	Healed up in 10 days with B.C.C. Vaccine when 2 yrs Surgical Treatment had been unavailing
122	Acute Pyelitis (R. Kidney 6th month Author's Case	32 R.K	F	Strepto-cocci Staphyl + B.C.C.	Rest in bed Lysol 1% but Urotropin + Sodium acid Phosph	Under Authors care at the Women + Children's Hospital Leed (Surgeon in Chief Mr Thomson)	Temp on admission 102° became normal in 6 days then rose occasionally to 100°+ after 15 days Temp became normal went to full term Chas Parturition + Puerperium normal remained under treatment up to term.
123	Pyelitis + Colitis R. Kidney	34 RK	F	B.C.C in pure culture	Vaccine 5 million + then 3½ million (21 doses)	Dr Crowe (Yelverton)	Bacteriuria persists but symptoms improve under Vaccine treatment Only relapses if overworked.
124 125	Pyelitis & Cystitis	RK RK	F	B.C.C in pure culture in Urine	Vaccine	Dr Crowe One Thousand inoculations chiefly in Private Practise B.M.J. Jan. 21. 1911	These got symptomatically well, but there is no note obtained as to presence of B.C.C. in urine or discontinuing the B.C.C. Vaccine treatment

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
126	Tuberculosis of Kidneys Nephrectomy	M	M	B.C.C. 7. B	Vaccine B.C.C.	Dr Crowe Yelverton (cont.)	Pat. died a few weeks after commencing Vaccine Treatment
127	Mucous Colitis		F	B.C.C in faeces	Vaccine B.C.C	"	Temporary improvement + then Vaccines useless.
128	Ischio Rectal Abscess			B.C.C from pus	Vaccine B.C.C	"	Case had become chronic + refused to heal. Vaccines were immediately successful + it rapidly healed up.
129	Appendix Abscess			B.C.C from scraping of a Foul Slaughters Appendix	Operation for removal of Appendix + then Vaccines B.C.C	"	Vaccine given post-operative + 7 amp subcut 6 hrs after 1st dose was given On general lines he thinks that where there is a large amount of pus found in peritoneum a Vaccine should be given.
130	R Ovarian Cyst + Left Pyo Salpingitis + Right Pyelitis Sullivan's Case	38 R.K	F	B.C.C. in Urine	Operation for removal of Ovarian Cyst + Salpingectomy	Under Sullivan of Theses Care at the Warneford Childrens Hospital Leeds (Surgeon in Charge Dr Craft)	Post Operative had an attack of Bronchial Catarrh due to Ether. 7 amp fell to normal 4th day after Op. At Op. Left Tube found to contain Pus. On 13th day developed symptoms simulating Pleurisy Had a rigor + T. went up to 104° Pyelitis diagnosed + under Urotropin 7. subsides + has left Hosp 6 weeks after Op T. seems normal for 2 weeks

Abstract (continued)

	Disease	Age	Sex	Organism	Treatment	Authority	Result
131	Chronic Cystitis Author's Case	32	F	B.C.C in urine culture from catheter specimen	Urotropin Helmitol Soda Bicarb Boric acid Calomel + Quarter injections for 4 days + daily dose of 37 Mx as Sulph	H. present under Author's care of Thesis	Symptoms relieved but bacilluria persists Boric acid aggravated symptoms markedly, but Soda Bicarb + Urotropine & Helmitol + were efficient in enabling patient to retain urine for 2 hrs + at night only once + sometimes not at to pass water
132	Chronic Right Pyelo Nephritis developed Post Operative to Recurrent Appendicitis + also subsequent to Dilatation + Curettage of Uterus Also has Chronic Ovarian trouble Author's Case	41 R.K	F	B.C.C in Urine	Vaccine Urotropin Appendix removed Uterus Dilated H. present is being treated for Ovarian Inflammation by Long douches + Urotropin for Kidney	H. present under care of Author of Thesis	The Ovarian pain + inflammation has subsided but to date the Right Kidney condition has not been influenced + but continues in a state of invalidism Vaccines used but not when under Author's care - They were prepared from an ordinary specimen of water. Not a catheter specimen. In this case one will consider operative procedure i.e Nephrotomy + Drainage

SUBDIVISION OF CLINICAL CASES QUOTED.

GENITO -URINARY.

CYSTITIS, 12 Cases quoted.

Acute Cases (3)	Chronic (9)
Case 47	Case 44
Case 63	" 45
" 64.	" 46
	" 65
	" 69
	" 70
	" 71
	" 71 a
	" 80
	" 131

COMPLICATED CYSTITIS.

CYSTITIS OF PREGNANCY, 1 case.

Case 43

CYSTITIS AND GONORRHOEA, 2 cases

Case 68
" 84

CYSTITIS AND STRICTURE, 2 cases

Case 48
" 50

CYSTITIS STRICTURE AND PYELITIS, 1 case

Case 61

CYSTITIS AND CALCULI, 1 case

Case 49.

CYSTITIS AND PYELITIS, 8 cases

Case 51 (L. Kidney)
" 54
" 56 (with Nephritic abscess)
" 58
Case 60 (Acute)
" 61
" 67 (w. Genococci)
" 68

CYSTITIS AND PROSTATIS, 3 cases

Case 1
" 2
" 85

NEPHRITIS AND DROPSY, 3 cases.

Case 109
" 110
" 111

PROSTATIC INFECTION, 4 cases

Case 77
" 78
" 79
" 83

PYELO-NEPHRITIS

Children, 14 cases

Cases 93 - 100
" 108
" 112
" 114
" 115

ADULTS ACUTE PYELO-NEPHRITIS, 3 cases

Base 3
" 51 L. K.
" 53 L.K.

CHRONIC PYELO NEPHRITIS, 20 cases.

Cases 53, 55, 58, 59, 60, 61, 67, 72, 73, 74, 75, 76, 86, 112, 113, 114, 115, 123, 124, 125

PREGNANCY CASES

Post-partum Pyelitis.

PREGNANCY PYELITIS, 7 cases.

Case 40, 41, 42, 43, 54, 116, 122

POST PARTUM PYELITIS, 4 cases

Case 47, 88, 89, 90

PUERPERAL SEPSIS, 22 cases

Case 5, 87 (20 cases), 91, 92 (two cases)

TUBERCULOSIS AND B.C.C., 4 cases

Case 62, 66, 117, 126

NEPHROSIS, 2 cases
Case 57
115

FALLOPIAN TUBE, 1 case
Case 81

UTERINE PUS, 1 case
Case 82

COLITIS, 3 cases
Case 105
127
128

GENERAL SEPTICEMIA, 1 case
Case 104

EYE CASES, 4 cases
Case 106
107
111
118

SINUS SUPPURATION, 1 Case
Case 119

OPERATIVE SEPSIS, 45 cases
Case 4
5 - 27 (22 cases)
27 - 39 (12 cases)
52
56
57
115
129
130
136

SKIN, 3 cases
Case 120
121
123

GENITO-URINARY.

ACUTE CYSTITIS. History one week.

Case 64 in a Male age 29. Typical symptoms of Acute Cystitis. Temperature up to 103 and irregular. Under ordinary treatment for 2 months no improvement. Urine typical pyuria and B.C.C. Blood agglutinated B.C.C. 1 in 128. After 2 weeks vaccine treatment rapidly improved and though bacilluria persisted he was able to hold urine for 4-6 hours, and did not require to rise at night at all. Improvement most marked on being given vaccine. Dose 10 millions up to last dose 50 millions.

(Report of Results in Certain forms of Genito-urinary Diseases treated with vaccines, J.H. Cunningham, Transactions of American Association of Genito-Urinary Surgeons, Vol. V.

Case 65. Female, age 30

History of several months symptoms of Cystitis.

Urine Pyuria and B.C.C. in large numbers. Blood agglutinated B.C.C. 1 in 128. Treatment, Vaccines B.C.C. 10-200 millions for 3 weeks. Symptoms rapidly improved, and after 3 weeks urine contained no B.C.C.

(Cunningham, Vol. V, Am. Ass. of Genito-Urinary Surgeons)

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(Cunningham, Vol. V, Am. Ass. of Genito-Urinary Surgeons)

In Children the condition of Cystitis is usually described as cases of Enuresis or nocturnal uncontrol of the bladder.

The acute condition of B.C.C. infection hasbeen most described as Pyelitis (Still, Thomson etc.)

CHRONIC CYSTITIS. Urine in all cases Pyuria and B.C.C.

These cases are very numerous and there are references to 12 cases.

Case 44. (Treatment of affections of Urinary Tract with Bacterial Vaccines. Hartwell & Streeter, American Ass. of Genito-Urinary Surgeons, Vol.V.)

History, 4 - 5 years. Frequency, day and night.

Urine, Pyuria, B.C.C. Cystoscope, Cystitis. Ordinary treatment no avail and Vaccines given. At end of 2 months symptomatically well but bacilluria persisted.

Case 43. Female, 28 years. History 11 years, sequel to child-birth, and seen with Acute Cystitis. Vaccines in 4 months gave complete symptomatic relief. After 5 mos. received vaccines for 5 months more. Bacilluria persisted.

Case 46. Male, 41. Frequency, 1 week. Gonorrhoea previously (3 years before). Urine, pyuria pus and blood and B.C.C. Vaccines 4½ mos. Bacteria free 15 mos. later. Culture slight

B.C.C. and also Staplylococcus albus. Upon taking $CuSo_4$ B. C.C. disappeared.

X) Case 131. At present under Author's care. This is a typical case of Chronic Infection. Female, Post Office Clerk, age 32. Single.

Jan. 31,/12. Complaint that for past 5-6 years has suffered from frequency of micturition, with distressing sense of strangury. Has to get up 7-8 times in the night and cannot hold water for more than 20 minutes during the day. General History: Patient is thin and delicate, also suffers from asthma for which she is periodically treated. Not constipated, but gives a history of suffering more or less since childhood from thread worms. Complains of Vulva itching. Treatment: Bladder examined through vagina and no calculi felt. Catheter Specimen drawn off and on culture B.C.C. found to be present in great quantities. Urine Sp.G. 1038. Strongly acid. No albumen. Naked Sometimes clear after treatment, but very often there is a thick deposit of urates. Colour, light to dark amber. Microscope, numerous amorphous urates, a few oxalates and crystals, and some coliform mobile bacteria. No pus cells noted. Culture, pure B.C.C.

Treatment. Given: P t. Acetat and C in grs. XX for 7 days. No improvement.

Then: Urotropin grs. X t d, and
Sod. Bicarb. 37 ad nocte,
Plenty of fluid.

Patient improved and was able to hold water for 2 hours and for two nights did not have to get up at all. Then as there were some relapses I tried her on Dr. Anson's plan of endeavouring to increase the acidity of the urine and this I found to be disastrous.

Urotropin grs. X - t l d, and
Acid Boric grs. X b. d.

Patient after taking Acid Boric has severe stranguancy pain, and no rest from frequency of micturition. She tried this treatment for 4 days and suffered intensely. On returning to

Urotropin grs. X t l d and
Sod. Bicarb. 37 ad nocte

the relief was remarkable. She now continues above and obtains symptomatic relief, but bacilluria continues, though number of B.C.C. is diminished per field of high power microscope. Her circumstances do not permit of her affording Vaccine treatment. Possibly it would be of value. Of course she is being treated at the same time for the worms by means of Quassia Injections, and occasionally alimentary antiseptics.

CYSTITIS ASSOCIATED WITH GONORRHOEA.

Case 46, Male, age 41, previously referred to as a B.C.C. Cystitis, had gonorrhoea 3 years previously. Hence no doubt the previous infection was a factor in the subsequent B.C.C. infection. As previously noted this case became Bacteria free.

Case 68. Male, age 32. Also had suffered from gonorrhoea 10 years previously, but this case showed a mixed infection of first Staplylococcus Albus and subsequently B.C.C. The Staplylococci Vaccine for 2 months produced no effect, but B.C.C. Vaccine caused diminution of bacteria though they persist.

(J.T. Geraghty, "Rebellious Bacillimia," Ass. of American Genito-Urinary Surgeons, Vol.IX, /09)

Case 84. Male. Genococci and B.C. Under bacterial emulsion improved, but B.C.C. persisted.

Case's 69, 70, 71, 71 b. (Results from Autogenous Vaccines, Geraghty)(Transactions of American Genito-Urinary Surgeons) Vol. IV, /09. All these cases were treated by ordinary methods and vaccines, in general condition some improvement, but bacteria persisted.

Case 72. This had Micrococcus Ureae in association. Vaccines had no effect.

CYSTITIS PYELITIS AND CALCULI.

Case 49. M. Age 60

This was a mixed infection, first B.C.C. and later Streptococci. Had previously had operation for Renal Calculi 9 years ago. Cystotomy and several stones removed. Prostatic enlargement and second cystotomy. 17 months treatment with irrigations, Urotropin and Vaccines of B.C.C. and Streptococci. Much improved but Bacteria Streptococci persisted.

X Case 115. Seen and Watched at South Devon Hospital. Plymouth. age 66. F. Physician, Dr. Soltau, Surgeon, Mr. Woolcombe.

History, admitted June 16, /11, discharged Oct. 29, /11.

Well until 8 weeks ago, then began to feel very weak, since then weakness and wasting have become pronounced. In bed 8 weeks. Has vomited on average at least once a day during last few weeks, always in connection with food. Pain over the lower end of the sternum after food, then vomiting may occur, which relieves the pain. No Haematemesis. Much thinner.

Previous History. No previous attacks. Rheumatic Fever 30 years ago. Family History: no children, married 16 years. Condition on admission, thin, pale, anaemic. Eyes react normally Chest, heart and lungs N. a. d. Abdomen N. a d. Legs, slight

aedema, R. leg fixed painfully on movement, friction at hip joint in position of adduction and Int. Rotation.

Progress.

29. 6.11. Vomited several times, generally after food. Examination of vomit one hour after - No free H.Cl., no albumoses or peplone. Urine, fair quantiti of albumen, some pus present.

25.6.11. Urine, Sp.G. 1010. Acid, much pus, no casts seen, some organisms. Stain, Gram. Negative Bacillus. Culture, B.C.C. grown profusely and also slight growth of Staplylococci. No T.B.

3.7.11. No cystitis, in fact decreased frequency. Bladder quite clear and clean after emptying with catheter. L. Kidney region tender on pressure, no tumour felt.

7.7.11 Urine alkaline. Contains much pus, few epithelial cells, and triple phosphates. No blood. Urea 1.5. X Ray gave shadow of Calculi, Query, two, one large and one small?

25.7.11. Slight rigor yesterday.

17.8.11 Pus increased in quantity in urine, Patient vomits after H elmetol also always after milk but not other things. Urine acid, thick cloud of albumen, much pus. Temperature normal for the first four weeks.

Temperature, normal for the first four weeks, on 31st day after admission went up at night to 100° and varied up to 101°4 (highest point). First onset of temperature developed after second dose of B.C.C. Vaccine, 26 hours later. Dose 60 million. First dose 30 million, no effect upon temperature. Temperature continued somewhat intermittent, and after third dose B.C.C., T. did not alter much.

Diagnosis now made that patient was suffering from Renal Calculi and Pyelo-nephritis. Operation of Nephrectomy advised, and performed by Mr. Wòolcombe.

28.8.11. L. Kidney removed and found to be nothing but a bag of pus and there were three calculi. Patient made a good recovery eventually, but it was slow. Wound healed completely, but septic scar.

Urine, 31.8.11, Sp.G. 1012, acid, clear, no pus or albumen.

" 4.9.11. Neutral. No pus or albumen.

Temperature intermittent for a time. Pulse 90 - 104.

Discharged feeling much better, having gained in weight. There is no note whether B.C.C. persisted.

Treatment: Alkalis, Aspiren (for pain)
Urotropin
Bladder washes with Borax
Gastric Sedatives
Helmetot
Vaccines, 3 doses at intervals of 10 days.

All above treatment no effect, and the recourse to surgery was amply justified by results ultimately obtained.

CYSTITIS AND STRICTURE.

Case 48, M, Age 72.

Had operation Peroneal Section, B.C.C. At end of a month with Vaccines could hold urine 5 hours and no rising at night. Treated with vaccines for 1 year immediately any symptoms returned. Had a second course for 8 months, and although profuse B.C.C. at discharge was able to take a long journey. Symptomatically well.

Case 50, Age 52. Old-standing stricture, Peroneal Fistula. Similar to above, but bladder was trabeculated and ulcers at base of ureters. Treated 2 years and then able to go to work, after irrigations, urotropin and vaccines, but profuse growth of B.C.C. Symptomatically well. Ulcers treated.

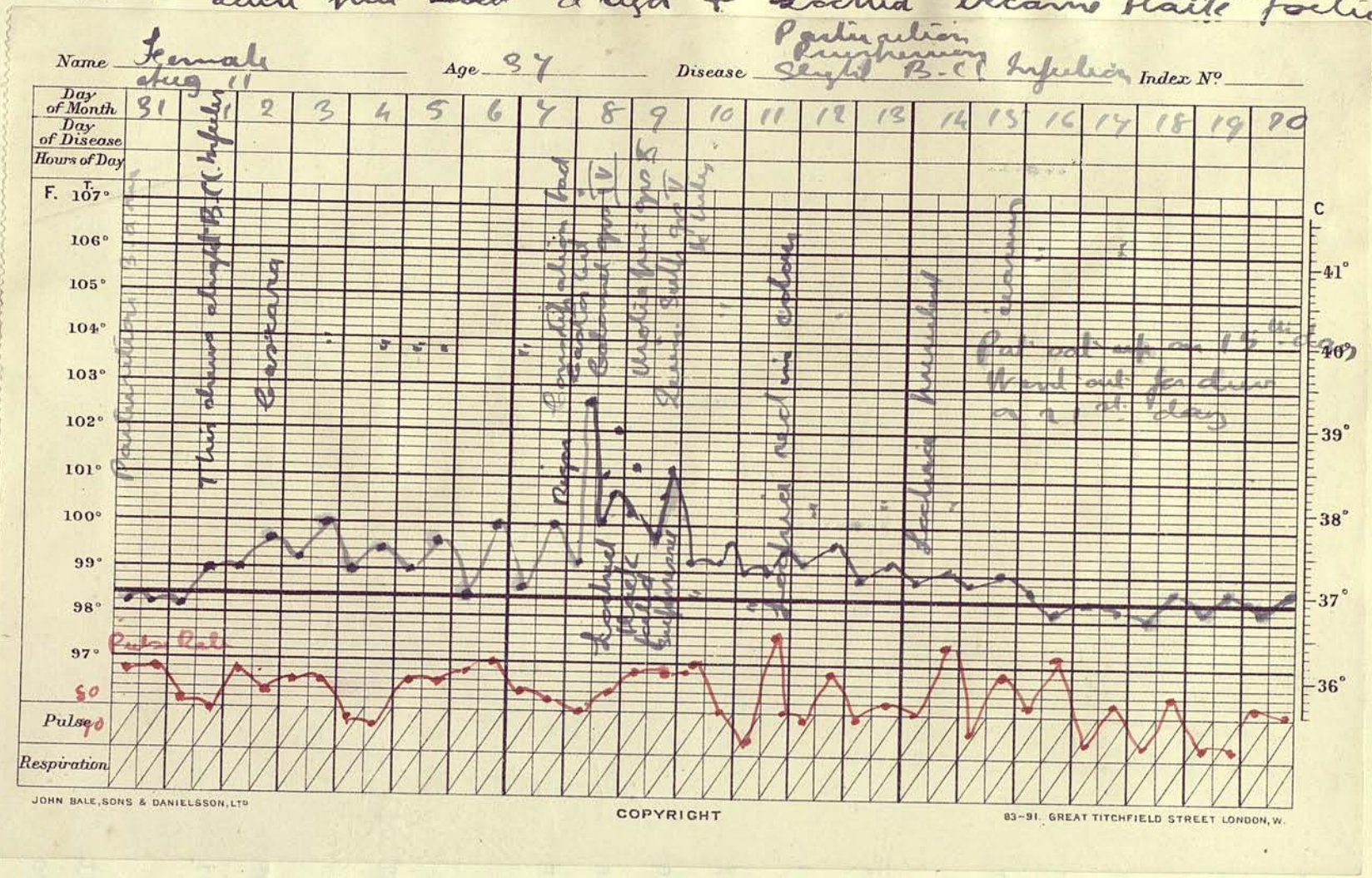
(Hartwell & Streeter etc., Massach. General Hospital Number 2, Vol.III)

CYSTATIS OF PREGNANCY. CASES are quoted.

Case 43. from Dr. Burnett's Article, "B.C.C. Infections complicating Pregnancy," Transactions of Edinburgh Obstetrical Society, 1910.

A case of primipara, who 12 months previously had had Acute Cystitis. Developed acute symptoms of abdominal pain in hypogastrium and cystitis. T. 101° Urine, typical B.C.C. infection. Under medical treatment symptoms subsided and parturition and puerperium were normal.

Chart of Patient who during Pregnancy suffered from Lumbago
Urea was acid S/L S. 10 25. Urates Numerous odiform bacteria
1st. part of chart shows a slight infection + when complications became
until had head a rise + bacteria became Static failed + suppressed
for 4 day



X A case under my own care recently had symptoms of mild cystitis during pregnancy, i.e. frequency but no pain. Urine always acid and deposit of urates and some coliform bacteria.

Previous history, some urinary infection when a child, enuresis etc.

This patient went to full term under medical treatment, but 6 days after Parturition gave anxiety by suddenly having a rigor and temp. of 103°. Bowels had not been properly opened since parturition. Lochia stopped and became black and foetid. One intra-uterine douche was given and treatment with Quin. and Urotropin was given. After three days temperature came to normal and never rose again and patient made a rapid recovery.

Before the bowels were successfully opened the patient had eight doses of cascara, 3ß & 3ī doses given at 4 hourly intervals and 3ī Castor oil and finally grs. III calomel and Mag. Sulp. 2 hours later, and this continued at 2-hourly intervals until bowels were thoroughly opened and also enemata.

That this case was entirely due to the obstinate constipation was proved by the subsidence of all symptoms on obtaining a thoroughly good evacuation. Pat. also had retention of Urine for two days. There was no symptoms of cystitis

This is an example of persistent B.C.C. infection during

Pregnancy, and post-partum, the Paresis of bowels no doubt allowing the B.C.C. to affect Uterus and cause cessation of Lochia.

(Under Pyelitis of Pregnancy further cases of B.C.C. will be quoted and commented on.)

PYELITIS.

The most numerous cases are recorded under this heading.

8 cases are described as Cystitis and Pyelitis.

9 Cases " in Children as Pyelitis.

23 " " in Adults " "

12 " " as Chronic or Recurrent Pyelitis.

In Children.

In infants there is fever, which is continuous and lasts for many days unless the cause is properly recognised and treated; recognition is only possible if the urine be carefully examined, and hence it is that fever in infants is often unexplained. The pyuria which is present in this disease is often not sufficient to produce turbidity or a naked-eye deposit in the urine. It may only be sufficient to be recognised by microscopic examination, and even this, if examined without centrifuging or standing may only shew half a dozen pus corpuscules.

With so little pus the amount of albumen present is so small that it may easily be overlooked unless a very careful examination is made. Still says, "sometimes I have scarcely

been able to satisfy myself that albumen was present, but the microscope shewed several pus corpuscules. The urine is usually acid unless rendered alkaline by potassium citrate.

Dr. Thomson (Edinburgh) lays stress upon the occurrence of early shivering or rigor in an infant as an early symptom of Rigors are so extremely rare in infancy, and early that their occurrence with onset of pyelitis may be of considerable diagnostic value.

Nervous symptoms may be prominent, there are many infants who with any considerable rise of temperature readily develop slight twitching of the face and eyes or limbs, which may pass into a general convulsion with loss of consciousness, but with acute pyelitis the cerebral symptoms are occasionally so severe as to simulate gross cerebral disease very closely. Still quotes a case, age 11½ months, Lumbar puncture suggested a provisional diagnosis of Tuberculous meningitis. Seven days after onset of illness urine obtained, and it was found to contain 12 pus corpuscules per high power field.

Treated with Pot. Cit. and child made a Normal recovery.

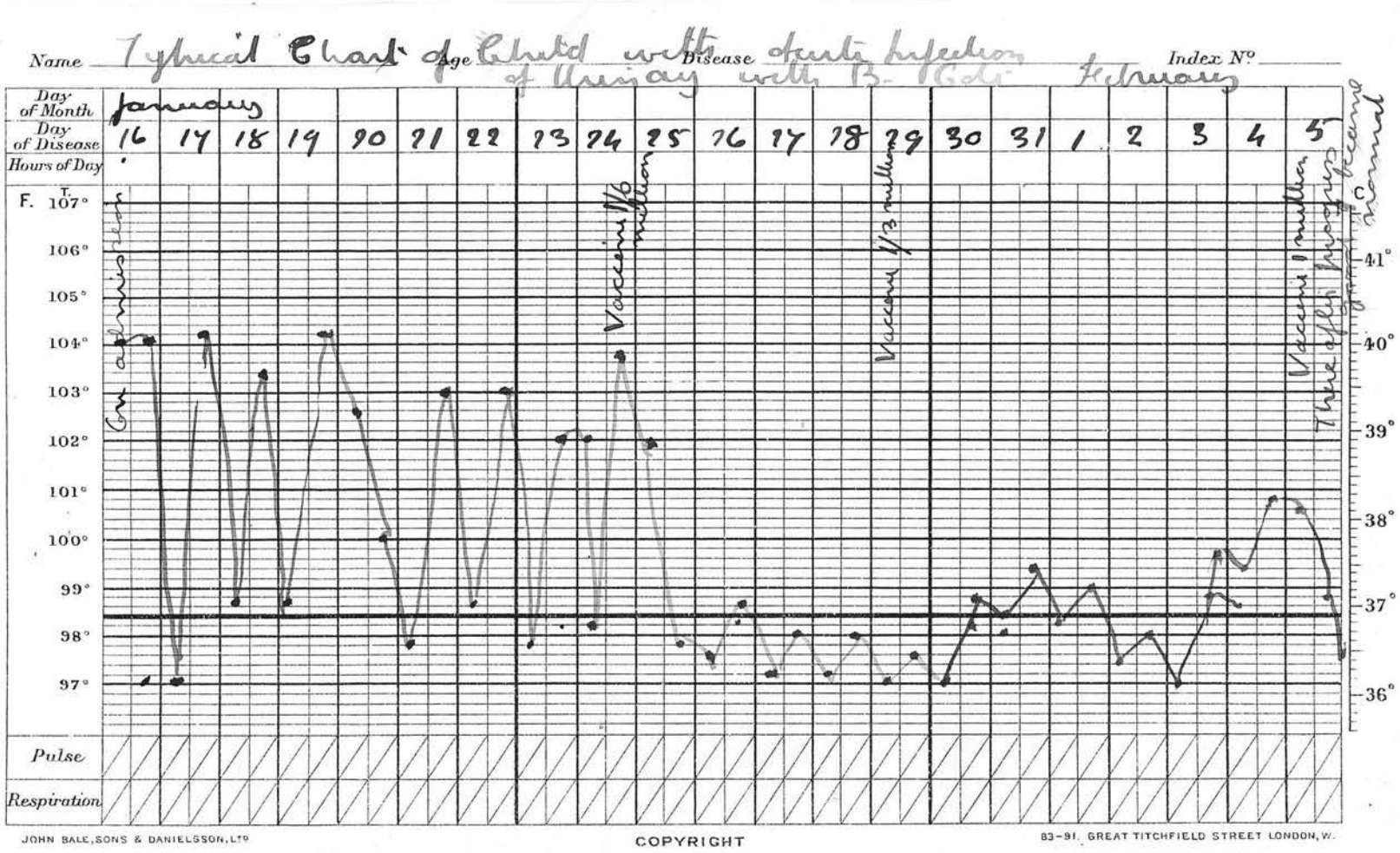
Bacterial evidence in the majority of cases of pyelitis in children shews the B.C.C. to be the organism most constantly found.

Sex. Most frequently found in the female and this suggests that the infection is Ascending (see note on Diaper infections previously referred to). The B.C.C. then travels to the seat of election, the pelvis of the kidney.

It is noteworthy that in many of these cases there have been unhealthy stools passed either with actual diarrhoea or other evidence of intestinal disorder, just before the onset of pyelitis. But if this be the order of events it is difficult to see why the bladder should escape, and indeed it might be asked why the pyuria is supposed to be of renal rather than vesical origin; the only point that very strongly indicates the kidney as the seat of inflammation in these cases is the absence of frequency of micturition, whereas when the bladder is known to be involved this is one of the most marked symptoms.

It might be suggested that the presence or absence of this symptom depends merely upon the reaction of the urine; in cystitis the urine is often foul and ammoniacal, whereas in pyelitis the urine is acid, not foul; but there are cases of B.C.C. infection of the urinary tract in children in which the urine is acid, and therewith there is great frequency of micturition with febrile symptoms; clearly these form a different group to those that I am now considering, and at present one may accept the

Case 112 Chart of Acute Infection
Lended by Rolleston



view that in the one case the bladder is affected, and in the other the kidney, but this seems highly improbable, especially as it would entirely fail to explain the special incidence of pyelitis upon female infants.

If the infection be carried by the blood it is difficult to understand why it should be limited to the pelvis of the kidney. Unless one or other of these modes of infection be accepted, we must suppose that males are infected in the same way as females by the passage of the B.C.C. along the urethia. I suppose there is nothing inconceivable in this; the gonococcus in female children finds its way sometimes from the vulva through Uterus and Fallopian tubes to the peritoneum, and the male urethya is in contact with diapers soiled with faeces from which the B.C.C. may find its way along the urethia and ultimately reach the pelvis of the kidney as the gonococcus is thought occasionally to do in adults.

The Clinical Picture. Onset is sudden.

A female child acutely ill, and in considerable distress although with no definite evidence of tenderness or pain anywhere. Temp. is high, up to 105° or even higher, and nothing is found to explain condition unless urine be examined.

Dr. Thomson (Edinburgh) records 8 cases, all in females.

Dr. Holt (America) " 1 " in male infant

Dr. Still " 2 " " "
aged 4½ and 7 mos.)

and 8 cases in females (5 infants) 3 older children

Dr. Lankester " 1 female case

Case, Female, age 14 mos., seen by Dr. Lankester. The illness began on Sept. 5th, the child had been quite well up tp that day, but whilst being dressed in the morning she went blue, and seemed cold and faint, the temperature was found to be 104°, but nothing was found to explain it. During the early stage of the illness the nurse noticed that once or twice the child's chin worked as if with shivering. The fever continued, byt beyond some fulness of the abdomen and fretfulness of child, no symptoms were found, and the condition remained a puzzle until the child, who had been taken ill while at the seaside, was brought home and placed under Dr. Lankester's care; the urine was then obtained and found to be acid with sufficient pus to make it just turbid; it had the peculiar heavy odour which is noticeable when urine is infected with B.C.C. and a bacillus was found in it, which appeared to be this micro-organism.

On Sept. 14th Pot. Cit. was begun, the temperature became

lower, and after a few irregular rises remained normal. Urotropin seemed to improve the condition of the urine in this case, but the Pot.Cit. for which it was substituted had more effect in reducing the temperature.

(Common Disorders of Childhood, G.F. Still, 1909)

Case 112, F. age 2. Quoted by Rolleston (Acute Pyelonephritis) Treated by a vaccine and became symptomatically well.

Case 114 Age 13. A case of Pyelo-nephritis of both kidneys and Cystitis. B.C.C. Treated with Pot.Cit. and became symptomatically well.

ACUTE PYELITIS. (Hartwell & Streeter)

Case 51 This case is typical. Admitted April 6, 08. Woman age 35, following history of:- 10 days previously severe bladder pain, passed blood; a few days later pain felt in the R. kidney region and soon after the left. Examination showed rigidity in both upper quadrants of the abdomen and tenderness in the flanks over both kidneys. Cystoscopic examination. Bladder reddened and injected, with ulcerations, pus from the left ureter. Indo-carmine test showed delayed action on both sides, especially the left. Process was bilateral.

Urine acid, 1012 Slight trace of albumen, sediment pus, squamous and round cells, no casts.

Culture, profuse growth of B.C.C. T. 103.6. P. 90

Treatment: Bladder irrigated with boracic solution and given urotropin.

Course: Vaccine treatment started April 19. General improvement. Much less pain, less sediment in urine.

May 14. (6 weeks later) discharged to C.P.D. where vaccine treatment continued. Culture, slight growth of B.C.C.

June 3. Complaint of slight pain in left kidney region. no tenderness or rigidity. Cystoscope, bladder normal. Slight oedema of the ureteral orifices, which were otherwise clear, and functionating normally.

Urine, culture showed no growth. Discharged.

SYMPTOMS TO RELY ON FOR DIAGNOSIS are:-

(1) Pain just below costal margins, Cystitis may or may not be present.

(2) High temperature and somewhat slow pulse.

(3) Ureteral catheterisation proves pus coming from kidney.

(4) Culture from ureter proves that B.C.C. are coming from kidney and hence one can diagnose condition as Acute Pyelitis.

Case 53 This case improved markedly under vaccines but bacillimia persisted and apparently case became Chronic Pyelitis. Died at another hospital after operation for Salpirigitis.

ACUTE PYELITIS WITH PREGANACY.

My attention was first drawn to the association of B.C.C. in Urine and Pyelitis of Pregnancy by the following case, which was under my charge at the Womens and Children's Hospital, Leeds. Personally I thought more of the Pyuria in the urine at that time than of the associated B.C.C. as the cause.

X Case 122, Female, married, age 32.

Admitted Sept. 30, 08, discharged Oct. 31, 08.

History of present illness:- one week ago patient was suddenly seized with pain in the R. side shooting down into the groin, the pain was at first very severe but has gradually got better. Vomited during the attack. Two days after onset of illness developed frequency of micturition every 10 mins., now about every hour. No blood in urine but it was very thick, Never had such an attack before. No illnesses.

Condition on admission: Patient is pregnant about 6 mos. Poorly nourished. Temperature 102° P. 100. Chest N.a.d. Abdomen, marked tenderness in R. loin. None felt in kidney.

Uterus one finger's breadth above umbilicus. Foetal heart not heard. Urine, strongly acid, SP.G. 1020. Albumen found, thick deposit of pus. Microscope, pus cells and numerous bacteria. Urine cultivated specimens. Acid, Albumen. Microscope, no crystals, a few casts, many white cells. No red cells. Numerous mobile bacteria.

Bacteriologist Report - No. T.B. Streptococci or Staphylococci. Culture, pure culture of B.C.C.

Progress - After 6 days treatment with

Urotropin X grs.
and Acid Soda Phosph.

temperature fell to normal and on two occasions thereafter rose to 100, and then only 99 occasionally.

Oct. 6. Patient no pain. Urine, Sp.G. 1020, acid, less pus. Still bacteria.

Oct. 26. Trace of pus in catheter specimen, patient still has slight evening temperature.

Oct. 31. There is no pus, but albumen persists. Numerous bacteria. Uterus enlarged to 7th month. Foetal heart heard.

Patient went to full term and was delivered of a healthy child. Puerperium normal. Medical treatment continued up to termination of pregnancy.

Case 54 F. age 21. Acute Pyelitis probably involving both kidneys, with abscess on Cortex. Operation decapsularation on R. kidney. Developed symptoms of Cystitis, became pregnant and owing to seriousness of symptoms Uterus was emptied, at 5th month of pregnancy. Pain R. side and frequency persisted and also bacilluria.

Second Pregnancy, At 2nd month similar symptoms. Had Appendicitis. Appendix moderately thickened. R. kidney found normal. Vaccines no avail. Was delivered after treatment at full term and had only 24 hours rise of temperature in Puerperium. Subsequently frequency of micturition and B.C.C. persistent. This case became Chronic Pyelonephritis.

This case developed acute symptoms 2 weeks after being married. The onset suggests origin of infection from Defloration as suggested by Widbolz (see previous notes).

(Hartwell & Streeter, Second Series.)

Cases, 40, 41, 42, 43.

(Napier Burnett Article (Transactions of Edinburgh Obstet. Society, 1910). These cases all had pyelitis. Pregnancy was from 4th month to 6th month. Three of these cases treated medically and reached full time. Case 42 aborted and thereafter symptoms subsided.

Case 116 Described by Routh. Treated by vaccines.

THE IMPORTANT SIGNS FOR CLINICAL DIAGNOSIS:-

(1) A rigor with sudden elevation of temperature occurring in a pregnant woman apparently in good health.

(2) Sudden onset of acute abdominal pain especially on the R. side.

(3) Attacks of "lumbago" in pregnancy.

(4) Well defined tenderness in the appendix.area, but associated with a wide area of hyperaesthesia over the R. renal neighbourhood.

(5) Acute abdominal distention sometimes so marked as to cause considerable respiratory embarrassment (and yet seldom described).

(6) A pregnancy cystitis that persists in spite of customary treatment.

(7) Pyuria in pregnancy.

These cases are of particular importance to all who have anything to do with pregnant women and indicate the necessity for a constant examination of the urine during the period of pregnancy, especial care being taken to use a microscope, for then only can the pus be seen and the presence of the B.C.C. be

easily identified, and any suspicion, or more than suspicion, be confirmed by subsequent culture, by one who is constantly on the look-out for this infection.

During a House Surgeoncy of the Women and Children's Hospital at Leeds and at the Glasgow Maternity Hospital (West End Branch), several of these cases came under my care with the above symptoms, the acute symptoms either subsiding on abortion - and this subsidence was most marked, often within 36 hours, and within a week the pyuria cleared up. More emphasis at that time (1906) was laid upon the pyuria than on the presence of the B. C.C. and cases were discharged when pyuria cleared up. With more knowledge of the subject one would take care to warn patients of a possible recurrence of such infection at a subsequent pregnancy, which could no doubt be held in check with adequate medical treatment.

I agree with Dr. Burnett that "Lumbago" in Pregnancy is not a symptom to be ignored. Doubtless many cases of this so-called Pregnancy Pyelitis, if all history could be obtained, date from childhood. Hence the importance of recognising and treating adequately this condition in infancy. The case under my own care suggests persistente of trouble, i.e. Enuresis, nocturnal

incontinence etc. , and then at first Pregnancy (4 of above cases are Primipara) the Pyelitis lights up again.

POST PARTUM PYELITIS.

Also one must recognise that Pyelitis may develop post partum and many unexplained Puerperal Infections may be attributed to this.

Polak on Puerperal Sepsis records onset of 3 cases of Pyelitis, the post-partum constipation and paresis of the bowels being a factor.

Three women were admitted with post partum pyelitis, having had repeated chills, elevation of temperature to 105° or more, with marked remissions, renal tenderness, and purulent urine. The B.C.C. was demonstrated in each. In two the left kidney was involved while both kidneys were infected once.

Treatment Posture, urotropin, water and vaccines resulted in symptomatic cures, though the B.C.C. could be demonstrated in the urine on dismissal.

ACUTE PYELITIS POST PARTUM.

Case 55. F. age 34.

Developed characteristic symptoms of Pyelitis after a

normal confinement. Parturition 3 weeks before. Treatment, Bed, $CuSO_4$ and vaccines. Result, urine became bacteria free.

POST PARTUM PYELITIS.

Case 92, etc. Polak.

Three women were admitted with post partum pyelitis, having had repeated chills, elevation of temp. to 105 or more, with marked remissions, renal tenderness and purulent urine. The colon bacillus was demonstrated in each. In two the left kidney was invloved while both kidneys were affected in one case.

Posture, urotropin, water and vaccines resulted in symptomatic cures, though the bacillus coli could be demonstrated in urine on dismissal.

These cases although described as developing post partum were probably latent, but of course the infection may have travelled by the lacerated cervix into the blood stream; but one cannot understand why the infection was not more general if it were a typical Ascending Infection. A Post partal pyelitis to me supports the haematogenous theory of infection as paresis of intestinal walls is so frequent.

One constantly recalls Dixon Mann's observation that Bacilli Coli appear and disappear in the urine and with increase

of numbers of B.C.C. clinical symptoms appear; hence, given a disturbed condition of the alimentary canal the B.C.C. are able to wander through the intestinal walls and thence to the kidneys, and on any occasions of insufficiency of the bowels such as occur during pregnancy, and especially post partal, with frequent obstinate constipation and bowel paresis, the lowered resistance of the body makes for a time when the Puerperal woman in especially liable to attack and invasion of B.C.C. Hence Pregnancy Pyelitis is most serious for the foetus but less serious for the mother, as her resistance is higher then than in the early Puerperium. Infection in the Puerperium is serious and many of these cases have no doubt been diagnosed as Puerperal Sepsis or Fever and patients have died. A more careful examination of these puerperal sepsis cases may reveal the fact that a pyelonephritis condition is sublying the whole clinical picture. Hence if the uterus is not affected with B.C.C., though many are in a generalised infection, curettage is useless, and also intra-uterine douching. But of course if B.C.C. is found in uterine cavity, then some uterine douching is often effective in early days.

PUERPERAL SEPSIS.

Case 5 Hartwell, Streeter and Green

(Treatment of Sepsis with Bacterial Vaccines)

Primipara, age 32. Boston Lying-in Hospital. Foot presentation. Third day a rise of temperature. Culture from the cervix showed a Streptococci predominating mixed with B. Coli. Curettage a slight amount of detritus. Abdominal tenderness with induration in both cul-de-sacs. Six inoculations of autogenous streptococcal and repeated douches. Sixteenth day temperature fell and general condition improved, abdominal tenderness disappeared, and further course normal.

Case 87 &c. "What can we expect from Vaccines in Puerperal Sepsis," J.O. Polak, M.Sc., M.D. (Trans. American Genito-Urinary Surgeons, Dec. 1910, Vol. VII, No. 3)

He reports twenty cases of Puerperal Sepsis in which the Staphylococci and Bacillus Coli were found in puerperal exudates which had suppurated. All these women had extensive cervical lacerations which had opened an avenue for invasion. The left ligament was the seat of the process in 19 cases while the R. ligament was involved in but nine.

Case 92 Polak

Two cases of Caesarian section. Both these women had been placed in the Fowler position immediately after the operation to favour uterus drainage. This also favoured the accumulation of blood in the cul-de-sac, which became infected by the B.C C. Autogenous vaccines caused a marked improvement in the general condition. A dosage of 250 million was used.

Pelvic Abscess. Only one pelvic abscess was post partal, this patient had several intra-uterine irrigations before admission. All were freely opened and drained through the vagina and all recovered promptly after the pus was evacuated.

These cases of Puerperal Sepsis are most important as again indicative of the necessity for determining the presence of B.C.C. in the urine ante-partum. If reference be made to cases occurring during Pregnancy it will be noted that the cases in which the B.C.C. was detected before parturition occurred, after receiving adequate medical treatment had a normal puerperium. It is of course frequently noted that post-partum there is constipation and bowel Paresis, and an onset of febrile attack dates from this being noted. Unless prompt measurees are

taken the physician in charge may be faced with a bad case of Puerperal Fever. A case under my own care in which the urine was suspected of having B.C.C., as there was given a constant history of thick urine and frequency, during Pregnancy attacks Lumbago on the 6th day post-partum developed a febrile attack and cessation of Lochia, due to a severe constipation which required drastic measures to get a movement of the bowels. I regarded this case as a slight B.C.C. infection but it was not serious.

Polak summarises his view on these cases thus:-

(1) Each cases of post-partum or post abortal infection must be studied individually and an accurate diagnosis must be made on the clinical bacteriological and blood findings, before any treatment is instituted.

(2) That nature is competent in the majority of instances to localise and circumscribe the infection.

(3) Vaccines are useful in all cases of puerperal infection, where the natural forces are incompetent to produce an individual resistance sufficient to overcome the infection; that they are a valuable addition to our therapeutic resources.

(4) OPerative interference, examination etc. during acute stage breaks down the barriers and opens up avenues for further

disseminations of sepsis and the danger increases with each month of pregnancy.

(5) Enormous pelvic and abdominal exudates may disappear without operation, and that in time enlarged ovaries, tubes etc. may assume their proper size and function, and further that as long as the patient's general condition improves no surgery is justifiable.

(6) All operations are attended with less risk after the acute stage of the infection has subsided, and then an exact diagnosis is more easily made.

(7) After the Uterus is thoroughly emptied, the pelvis should be left absolutely alone and we should make every effort to support the patient and increase the natural blood resistance.

(8) Vaccine therapy has a definite field in the treatment of puerperal septic infections in the subacute stage, and after the local focus has formed, it hastens convalescence.

Inoculations with autogenous vaccines will promise prompt results in Staptylococci and B.C.C. infections, but in Streptococci poisoning, vaccine treatment is unreliable, and is of value only when the virulence of the germ is attenuated, or when nature has already developed a phagocytic defence.

James Harrar M.D., "Puerperal Infection, its Clinical Varieties and Treatment," (Bulletin of the Lying-in Hospital, America, Vol.VII, March 1911, No. 4):-

describes the Puerperal B.C.C. Infection thus:-

"The Common clinical picture produced by the Colon bacillus is a severe toxemia beginning on the second to fifth day, and frequently with one or more chills. It is not especially distinguishable from the other taxemias except by the extreme foulness of the lochia, the odour being like that of the colon bacillus pus from a bad appendical abscess. It is in this variety of infection that the intra-uterine douche gently given has proved of greatest value.

Twelve cases of bacilluria toxemia were treated with intra-uterine douches and responded well to one or more irrigations with normal saline solution, The change in the general condition within 24 hours after administration of such douche was most convincing of the effectiveness of local treatment in this infection.

PelvicCellulitis.

The colon bacillus was an especially treacherous organism when invading areas already infected with a different species of bacteria. Many of these later insidious types of retro-

peritoneal cellulitis are augmented, and fatal peritonitis superimposed by a penetration of this organism possibly through the adjacent intestinal walls. This was the cause in two of the general peritonitis cases mentioned below, where a previous posterior vaginal section into a pelvic mass revelaed nothing but a cellulitis. Cultures made at the time of operation from exuding serum shewed streptococci. The later laparotomy for a general peritonitis disclosed the superimposed infection of colon bacillus in the abdominal field.

Cultures and smears from cervix uteri or evacuated pus shewed out of 57 cases,

Colon Bacillus in 4.

General Peritonitis. Results have been most unsatisfactory.

Cases 19. Cultures from Peritoneal Pus,

Colon B. 2)
" " and Streptococcus, 1) Died

10 Laparotomus, 1 survived - Staphylococci infection with pockets and adhesions

9 No operations, 9 died

Bacteremia. Mortality as great as in General Peritonitis.

Out of 28 cases, Colon Bacillus 2

" " and Streptococci, 1

Out of 175 septic cases Dr. Welch found B.C.C. in 46.

The Colon Bacillus was only identified from post-mortem blood culture once, where the body had been kept on ice. It was found in the heart's blood and the spinal cord. (See notes of General Infection by B.C.C.

Route of infection.

(1) From the paralysed and possibly squeezed rectum at last stage of labour, especially if this stage is at all prolonged. This supports the Transparietal route and provides the needful traumatised condition of the mucous membrane of the bowel which will permit of the wandering through of B.C.C.

(2) Ascending infection through the Vulva infected and traumatised Cervix into blood stream by way of lymphatics and probably directly through the placental site. We know that the entire contents of a poorly retracted Uterus, blood clots, decidua, and portions of placental tissue may become the feeding ground for saprophytes, and a culture soil for cocci, introduced from below.

The placental site is the area of least resistance, hence the frequency of phebitis and thrombosis. In the body of the Uterus, a natural protection to the infected forces is the formation of the granulating wall of leucocytes or the "Leucocytic

Wall of Burnn" associated with a small tissue cell infiltration which proba bly protects the organ against the attacking organism. Local Defence - The Wall of Burnn is more definite, the lower and less virulent the type of infecting organism, and not so definitely d efined when the organism is actively virulent: it may be absent when the streptococcus is of haemolytic activity. Such a coccus may enter the tissues and placental site within a few minutes after implantation, and can be found in the blood stream in a few hours. Hence in streptococcal infection intra-uterine douching is of no avail.

PUERPERAL SEPSIS TREATMENT.

Each case. general examination. Blood count and blood culture. Vulva and vagina cleansed and injury and local infection sought for, condition of cervix, the degree of patulousness, the height and retraction of the uterus and mobility, the condition of the parametrium and finally a bacterilogical examination of uterine secretion and a digital exploration of the interior of the uterus. Well contracted uteri with a closed cervix were not entered.

If anything found the uterus was packed with gauze soaked in Tinct. of Iodine and packs left for 30 minutes. No further treatment. If endometrium smooth, patient was given a single

intra-uterine douche of normal saline. Put in the high Fowler position as drainage removes medium for bacterial to live in. Ice bag and Ergot.

Minimise further bacterial invasion through a relaxed organ. Catheters avoided and the bowels emptied by repeated enemata. Distention controlled by lavage, enemata, and restriction of diet. Kidney secretion is maintained by the Murphy's drip.

Bacteriological Finding. If streptococci and leucocytes count low, with the polynuclear percentage high, a marked general intoxication is indicated and the phagocytes must be markedly increased or cocci opsenised in order that recovery may take place. Injections of saline solutions or collargol are followed by marked leucocytosis producing what is termed "Isaaefs Resistance stage," with temporary betterment of the condition.

Low white cell count and marked general symptoms show virulent or violent infections and suggest bad prognosis.

In patients in whom no local exudative process developed, vaccines seemed to have less effect. We believe Vaccines to be of most value in low type infections, becoming subacute.

No mass suppurated in any patient with a blood count of more than 20,000 leucocytes and a polynuclear count of below 82 %.

A mixed stock vaccine of Staphylococci and B.C.C. was used 20 times. It was noted that Staphylococci and B.C.C. were constantly present in exudates which suppurated. All these women had cervical lacerations which opened an avenue for infection.

The L. Blood ligament was involved in 19 cases, while the right but 9 times.

CHRONIC PYELITIS AND CYSTITIS.

X Case 108 Female, age 41. Watched at the S. Devon and E. Cornwall Hospital whilst under Dr. Fox.

Admitted 14.2.11.

Complaint, Ulceration of the Bladder.

History of Illness. Pain in the lower part of the abdomen with pain on micturition since Sept. 1910, but had other attacks previously, spreading over a period of two years.

Urine is stated to be thick during the attack, but there is no blood. Micturition very frequent, averages 12 times a day, sometimes 8 times an hour.

Past history. Three years ago inflammation of kidney or gravel, was in bed 6 weeks. Severe hypogastric pain then. Face not puffy.

Condition on admission. Looks fairly well. Eyes react normally. Tongue clean. Heart and lungs N.a.d.

Abdomen, very large and pendulous. Measures at level of umbilicus 43½ ~~metres~~ inches. No free fluid. No tumour. Some tenderness on pressure over hypogastric region. No bladder tenderness or dulness.

Legs, varicose condition ? slight oedema.

Urine, Sp.g. 1018. acid, much pus, trace of alubmen, no blood. 17.2.11. Culture, B.C.C. in pus culture present.

Progress, Micturition 17 times for first few days per day and 10-11 times at night.

Treatment. 23.2.11. Vaccine 30 million every 10 days for 6 weeks.

Result Much improved and finally able to hold water for 2 hours and only disturbed once at night. B.C.C. however persisted.

CHRONIC PYELITIS.

Cases 53 (F), 58 (M), 59 (F. Calculi), 60 (F), 67 (M), 72 (M), 73(M), 74(M), 86 X., 61 (M).

Case 61, male.

After operation for Deep Stricture (Gonorrhoid) developed Cystitis and finally pyelitis. Vaccine treatment. Diminished bacilluria but bacteria always persisted, but able to return to work.

Case 67 Male, 24. Had Gonorrhoea and Locomotor Ataxia. Had dysentery before onset of B.C.C. infection. Ureteral catheterisation from which B.C.C. cultivated. Treatment, urotropin and vaccines. Improved but bacteria persisted.

Case 72, M. 32. Double pyelo-nephritis. Vaccines no use.

Case 74, M. 45. No cystitis. Pain in L. kidney. Ureteral catheterisation proved B.C.C. present in both kidneys. Vaccines no avail.

Case 75, Had also Locomotor Ataxia. Cystitis. Ureteral catheterisation. B.C.C. Vaccines no effect.

Case 76 (pedersen) F., 8. Finally improved under ordinary treatment. B.C.C. persisted.

Case 86. G.S. Marks. Pyelitis. Marked benefit from emulsion of B.C.C. but bacteria persisted.

NEPHRITIS.

Cases 109, 110, 111.

X Case 109. Watched at S.D. and E.C. Hospital, Plymouth. F. age 4½ years. Case under Dr. Fox. Admitted for Nephritis 17.12.10.

History of present illness:- has been ailing for 9 weeks, and for about last 6 weeks there has been oedema of face and legs.

Condition on admission - face very puffy, eyelids oedematous. Could just open the eyes, which seemed very painful. Thick yellow discharge issuing between the lids. Tongue white and furred. Chest N.a.d. No fluid at bases of lungs. Abdomen some free fluid present. Legs and back, very oedmatous.

Progress. 17.12.10 Oedema increasing, no urine passed. 7 p.m., 3 V urine drawn off, loaded with albumen, no blood. Treatment, hot air bath and wet packs. No sweating. Eyes closed. Yellow discharge. Bowels opened.

20.12.10. Oedema much less. Patient much improved. Urine passed.

29.12.10 Has been improving. Pulse rapid today, oedema much less. Great frequency of micturition.

1.1.11 Urine acid. B.C.C. present from culture of catheter specimen of urine. Given vaccines and other medical treatment.

6.1.11. Micturition less frequent. No oedema, albumen slight, pus and bacteria present.

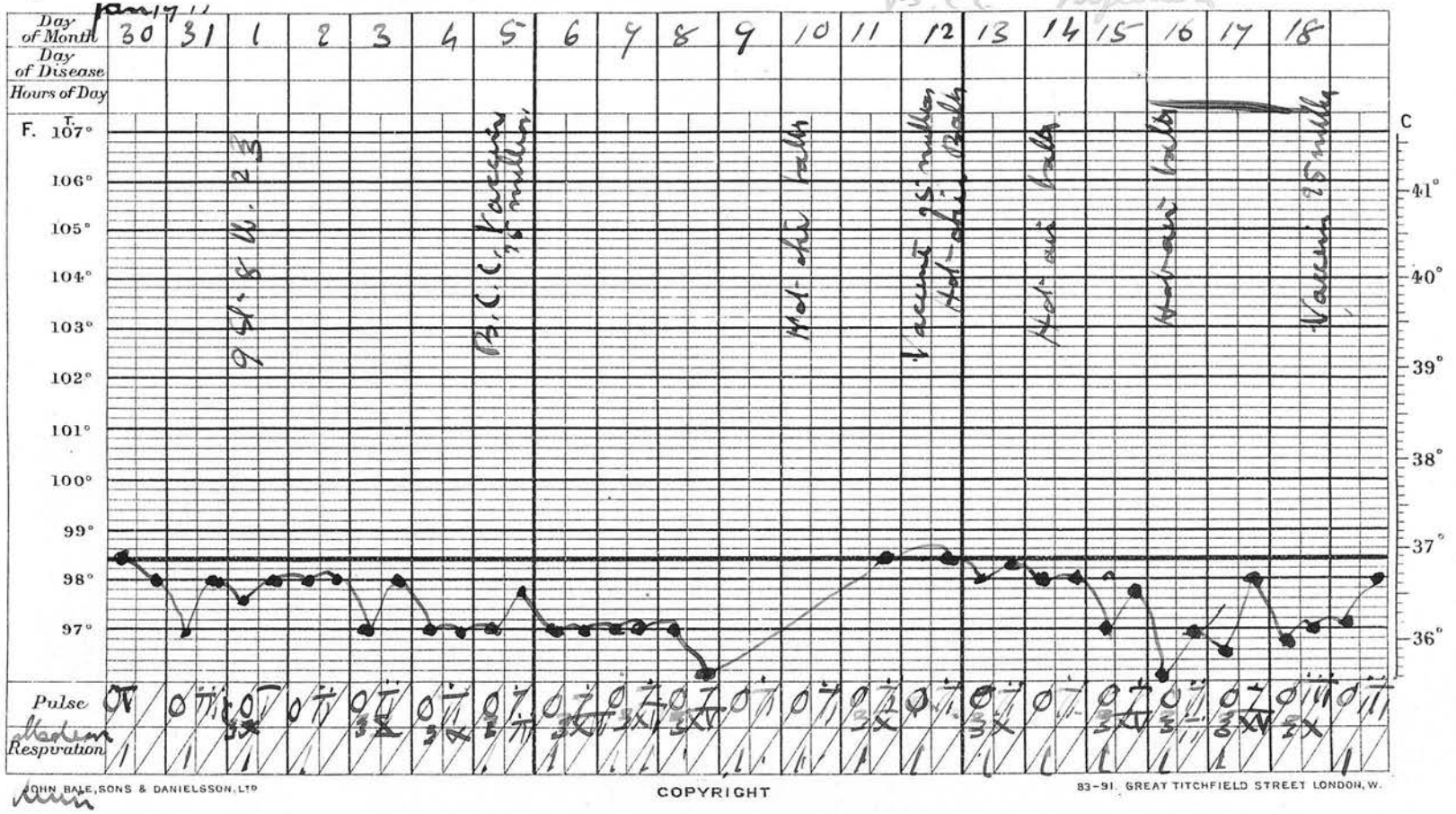
11.1.11 Cystitis present, pus in urine and B.C.C. still present. Treatment, usual medical remedies, Jalap, Packs etc.,

110.

Case emphysema Chronicities of Infection of B.C.C.

B.C.C. Vaccines had no effect & never caused any reaction

Female - Age 18 Disease Chronic Parenchymatous Nephritis + Infection B.C.C. Index No.



urotropin and Theocin. Vaccines given.

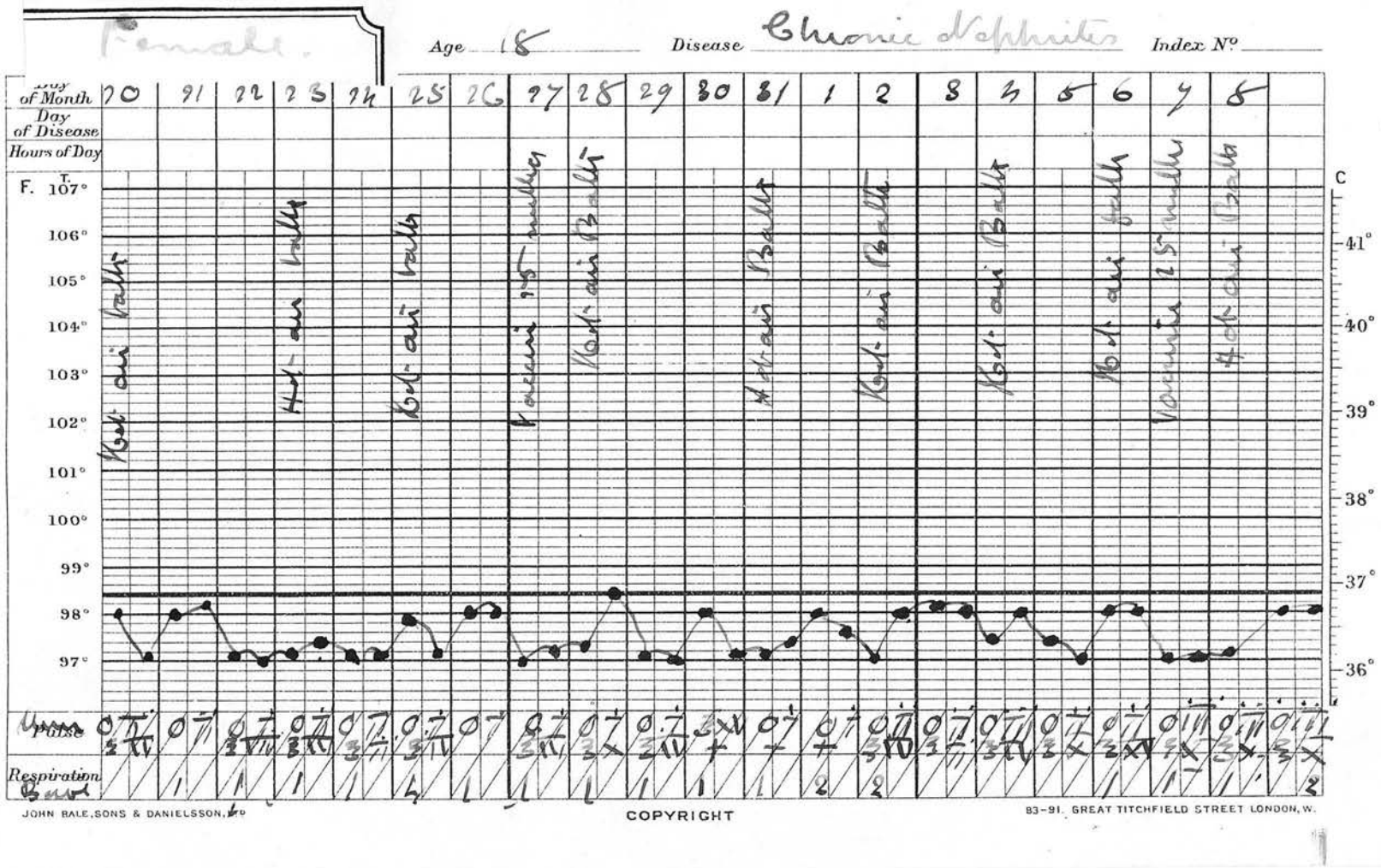
Under general combination of treatment child improved for a time, subsequently relapsed and finally was sent to Workhouse Infirmary as Incurable. B.C.C. persisted and oedema only kept in check by packs etc. Vaccines never proved of any permanent use.

X Nephritis, Case 110, Seen and watched at S. Devon and E. Cornwall Hospital, under Dr. Fox. Female, age 18. Admitted Oct. 7.11 for Dropsy.

History of present illness - patient was in usual health 4 months ago, when she noticed that her ankles became swollen and her face puffy, she continued to be about for 2 weeks, after which she was confined to bed for 3 months; during this time her water was noticed to be reddish in colour and little in quantity. Diet milk etc. During last two weeks has been getting out in the afternoons. Previous history - No scarlet fever, no previous illness. Family history - Brother and sister 11. All healthy. No history of any infectious disease in family.

Present condition, pale, anaemic, face somewhat puffy in appearance, coated tongue. Chest N.a.d. Back, considerable oedema over saccum and loins. Slight scotiosis with convexity to right. Legs, large white and oedematous. Urine, passed 3

Case 110. Exemplifying Chronicity of B.C.C. Infection
Vaccines never caused any reaction.



pints in 24 hours. Sp.G. 1010. Acid, clear not smoky. Albumen present in some quantity. Micturition frequent.

11.10.11 Much albumen, no B.C.C. Kept in bed.

16.10.11 Much less oedema in legs and back and over saccum. Albumen in urine less. Urine averages 3 XXX perday. Functions of eyes normal. Urine 1018. Slightly alkaline, much less albumen, granular casts found, no blood or epithelial scales.

28.10.11 Patient much better and oedema in legs and back slight, urine less albumen.

9.11.11 Albumen has been increasing; patient packed. Perspired freely, passes two pints urine daily.

16.11 11 Patient improving. Very slight oedema, no headache. Albumen diminished.

22.11.11 Condition same, no oedema at all, albumen present.

7.12.11 Albumen increased in quantity, patient on milk diet again, oedema in back and legs.

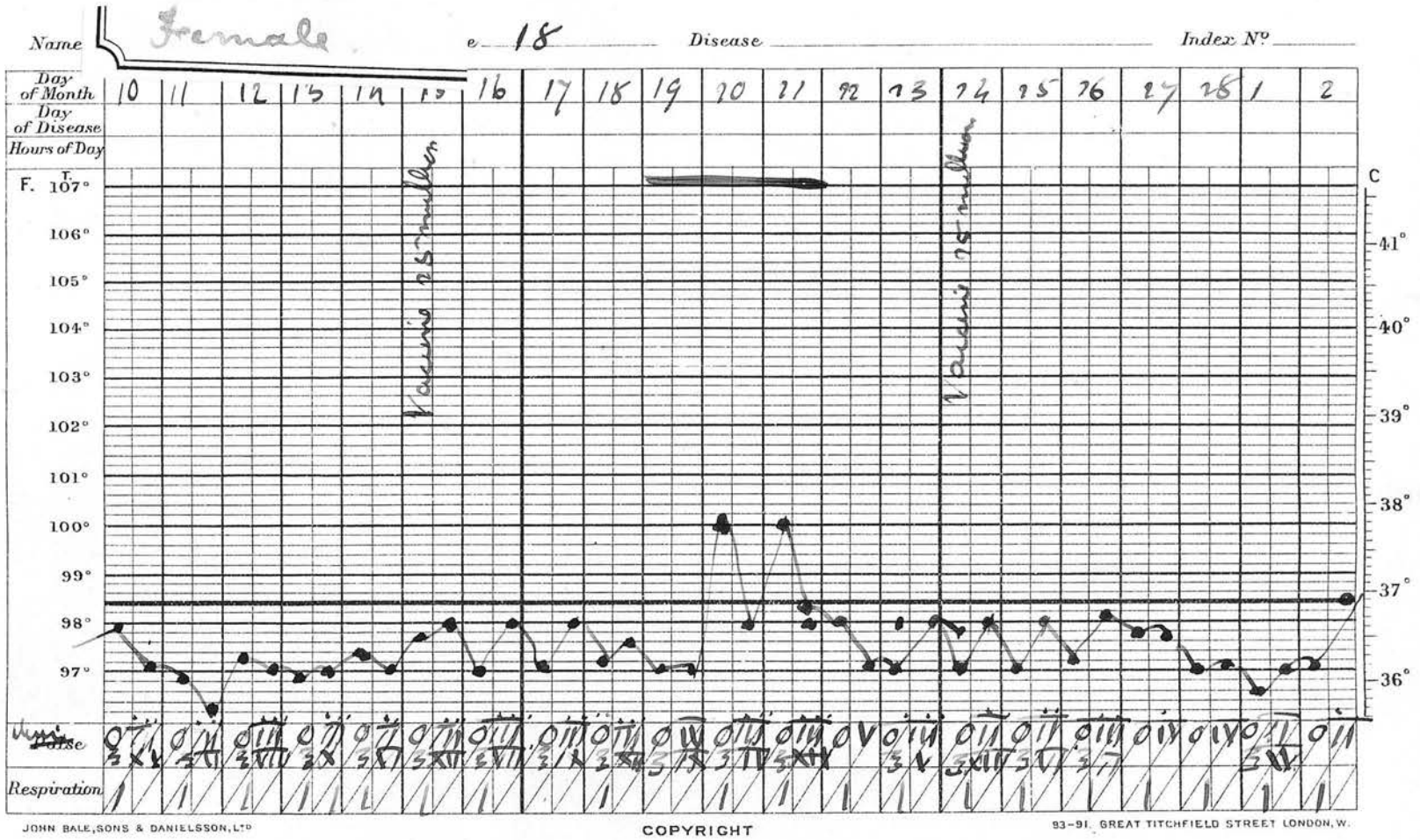
22.12.11 B.C.C. present in Urine.

27.12.11 B.C.C. present in urine

29.12.11 Albumen increased, oedema not marked.

1.12.11 B.C.C. vaccines given every 10 days.

Case 110 exemplifying Chronicity of B.C.I. Infection
Vaccines of no effect. Caused no reaction



Treatment:- Jalapa
Ferrum
Theocine
Hot air baths, packs
Diuretin
Vaccines proved of no use and with usual medical remedies patient always improved temporarily if kept strictly in bed.

Two months after discharge from hospital she died.

Case 111. Quoted with Eye Infections.

These Nephritis cases seem to require some further work as to whether the B.C.C. is a cause or if it is an accidental association in a late stage of this disease and is when found of bad prognosis.

TUBERCULOSIS AND B.C.C.

Cases 62, 66.

One cannot enter into a full description of Tuberculosis of Genito-Urinary tract, except to point out that this complaint raises the thought that possibly the chronic slow excretion of B.C.C. through the kidney or the growth in the bladder of this organism may pave the way for the culture of the T.B. In most cases of Tuberculosis of Genito-urinary tract one may safely say that the B.C.C. will be found associated.

Case 117, Quoted from J.L. Bunch, "Skin Disease", is a rather remarkable case of Tuberculous Lupus Vulgaris in which

was found first Staptylococci and subsequently B.C.C.

Under Tuberculin and Staptylococcus vaccine patient improved and was almost cured, but relapsed in 2 months and then B.C.C. was found. On being given a B.C.C. vaccine the Lupus entirely cleared up.

Carmac Wilkinson's Method of administering Tuberculin is well suited to Lupus of the Skin.

B.C.C. INfection mistaken for Tuberculous Masses.

Dr. J. Charlton Brisco, Lancet Oct.30^{3}1909 p.1269, reported several cases of matting together of the pelvic viscera by an exudate showing caseous change and suggesting tuberculosis, but microscopic examination showed that the lesions were due to the colon bacillus which was also found abundantly in the urine.

This is also quoted in Lancet, Jan.6.1912, p.39.

(If reference be made to section on Pathology it will be seen that it is recognised that matting together and a fibroid change has been noted to be produced by slow constant infection of B.C.C.)

Case 126 B.C.C. Vaccine treatment availed nothing. Patient died a few weeks later after first injection of generalised tuberculosis.

OPERATIVE SEPSIS.

The Bacillus Coli has so frequently been found in operative cases and acknowledged as a source of infection that one has not much further to say about these cases, as much has already been written.

Case 4 Crile's Operative.

Autogenous vaccines of B.C.C. used, but it is not stated in the record whether B.C.C. was found in the urine.

Cases 5 - 27. 22 cases of Laparotomy Wounds, B.C.C. and Staptylococci. No statement as to B.C.C. in urine.

Cases 27-39 12 Cases. These were ill on average, 3-5 weeks.

2 Pelvic Abscesses
2 Septic gall bladders
3 Appendix Abscesses
2 Nephrectomies
2 other causes not stated
} No statement as to B.C.C. in urine

1 Pelvic abscess , first opened retroperitoneally, later through the vagina. Two months after first operation, when thoroughly septic, given 9 inoculations of autogenous B.C.C. vaccine during four weeks, improved so much that at the end of this time she could be sent home and a year after she reported herself well.

Case 52 Appendix operation, subsequently symptoms of cystitis and pyelitis (acute). B.C.C. foind in urine. Under vaccines B.C.C. and $CuSO_4$ urine become bacteria free.

Case 56

Nephrectomy for Multiple Nephritic abscess. Then Cystitis. Vaccines of no avail. Rest in bed relieved temporarily.

Case 57

Nephrosis for R. Kidney, later Nephrectomy. Vaccines given after Nephrectomy and urine became bacteria free, but finally B.C.C. remained slightly persistent.

Case 115

Nephrectomy and numerous calculi.

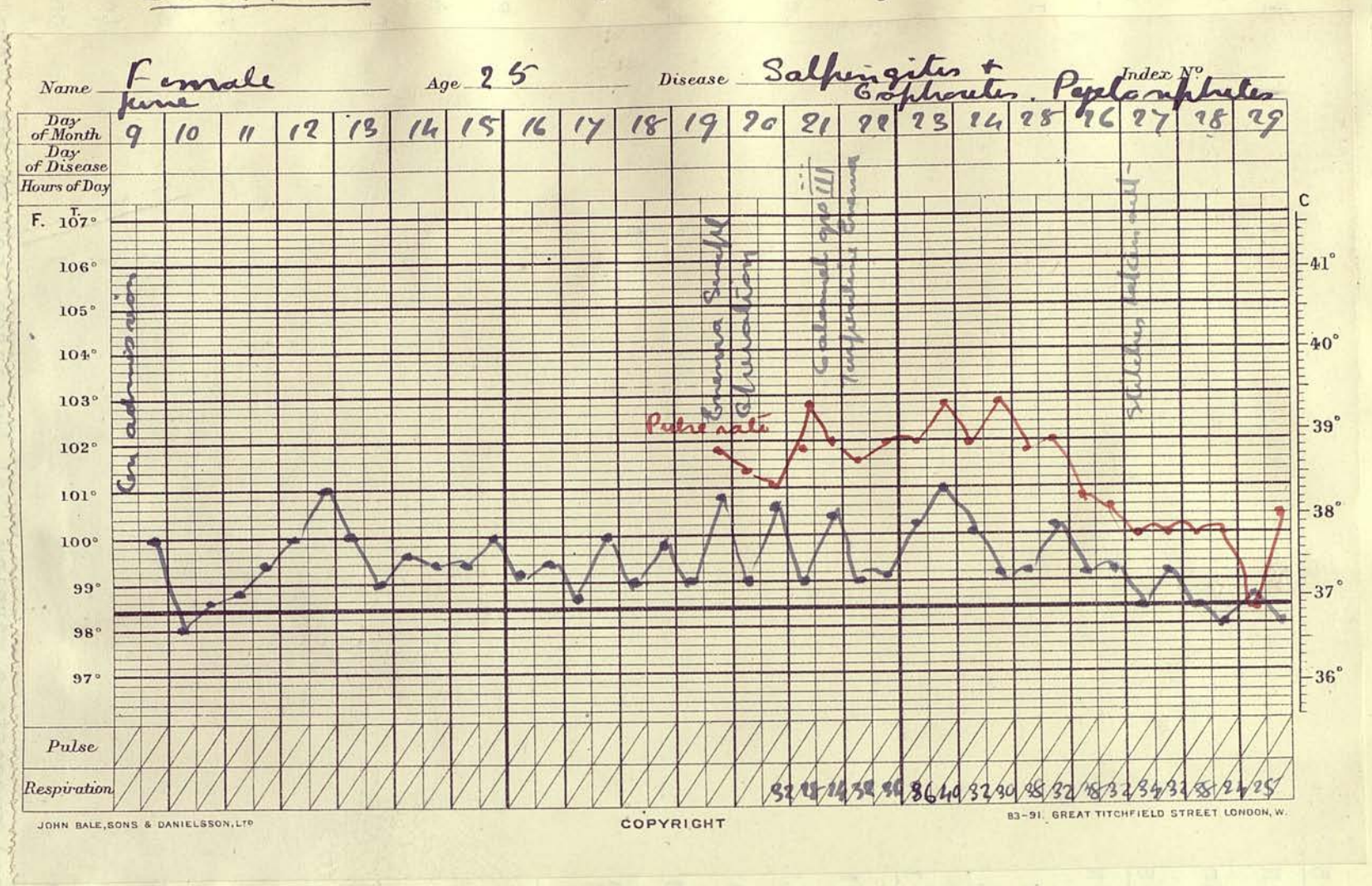
This case I watched. Patient made a slow recovery after operation but I have been unable to get a report of whether the B.C.C. remains persistent. She eventually gained very much in weight and went home fairly well.

Case 81

At operation B.C.C. found in the Fallopian tube. Dr. Barbour in discussion upon Napier Burnett's paper also quotes having found B.C.C. in lumen of a Fallopian tube, in a case of peritonitis in which he operated.

One feels that possibly long operations on the pelvis or bowels may produce the Bacillus Coli infection. The case of the man who developed a general B.C. Septicemia (quoted later) after an operation for Inguinal Hernia (he suffered from constipation) suggests a warning that the intestines in any operation should be manipulated very gently for fear of producing a

Case 130 Post Operative Pyelitis



generalised Bacteremia of B.C.C.

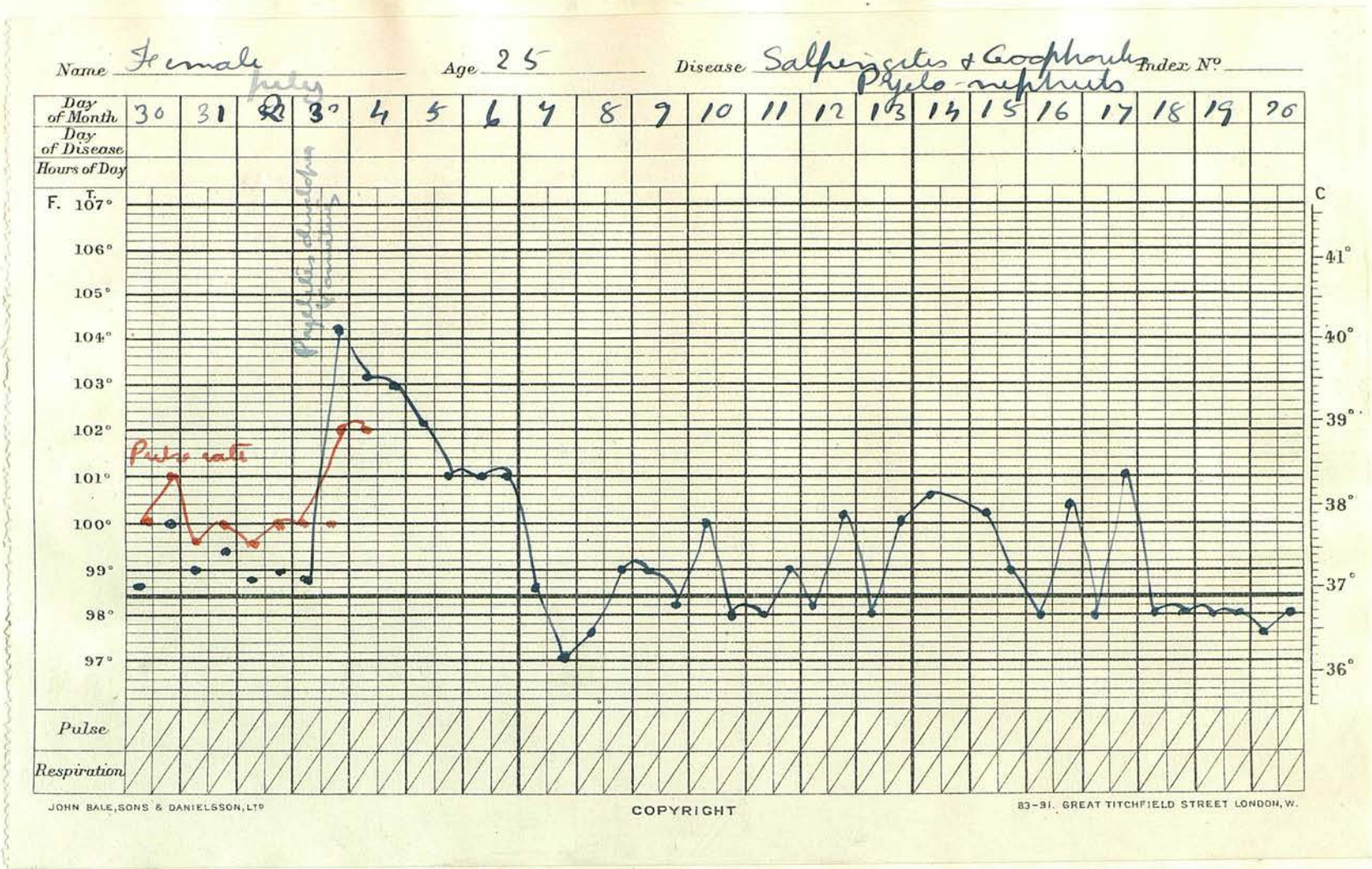
I can recall a case of a very adherent and matted Salpingitis and Gophoritis in which I assisted at her operation whilst House Surgeon at the Women and Children's Hospital, Leeds, and I append her chart as illustrating a pyelitis lighting up post operative. She gave me considerable anxiety while this temperature lasted. Under urotropin her condition improved and the urine cleared up as regards Pyuria. I have no note that B.C.C. were cultivated but I did note pyuria, and urine with numerous coliform bacteria seen by the microscope.

Pyelitis may be a sequelae in any abdominal operation, no matter for what the operation is performed. Any abnormal symptoms of rigor and pain in the back or anteriorly indicate a search and culture of the urine being made.

Case 132.

F. 40, At present under my own care. History, 7 years ago had operation for Appendicitis. Recovered and was quite well for 4 years. At operation adhesion and matting of ovary noted. 18 months ago had a curettage to scanty menstruation and Dysmenorrhoea. Two months later developed pain in R. region of kidney anteriorly and also increase of pain in R. ovarian region. No history of cystitis. Urine Sp.G. 1015, acid, a few pus cells.

Case 130 Post. Operative Pyelitis



B.C.C. found and grown on culture. Bacteria persist.

Treatment, Vaccines no avail. Had 6 doses of 30 millions. Once had a reaction with high temperature and headache. Under ordinary medical treatment pain is subsiding - i.e. urotropin hot douches. Improvement is slow.

Prognosis. In this case one doubts whether one may not have to do something to drain the kidney, as the constant pain is producing a state of neurasthenia and patient leads a very invalid life.

DEVELOPMENT OF PYELITIS POST OPERATIVE.

Case 130

X

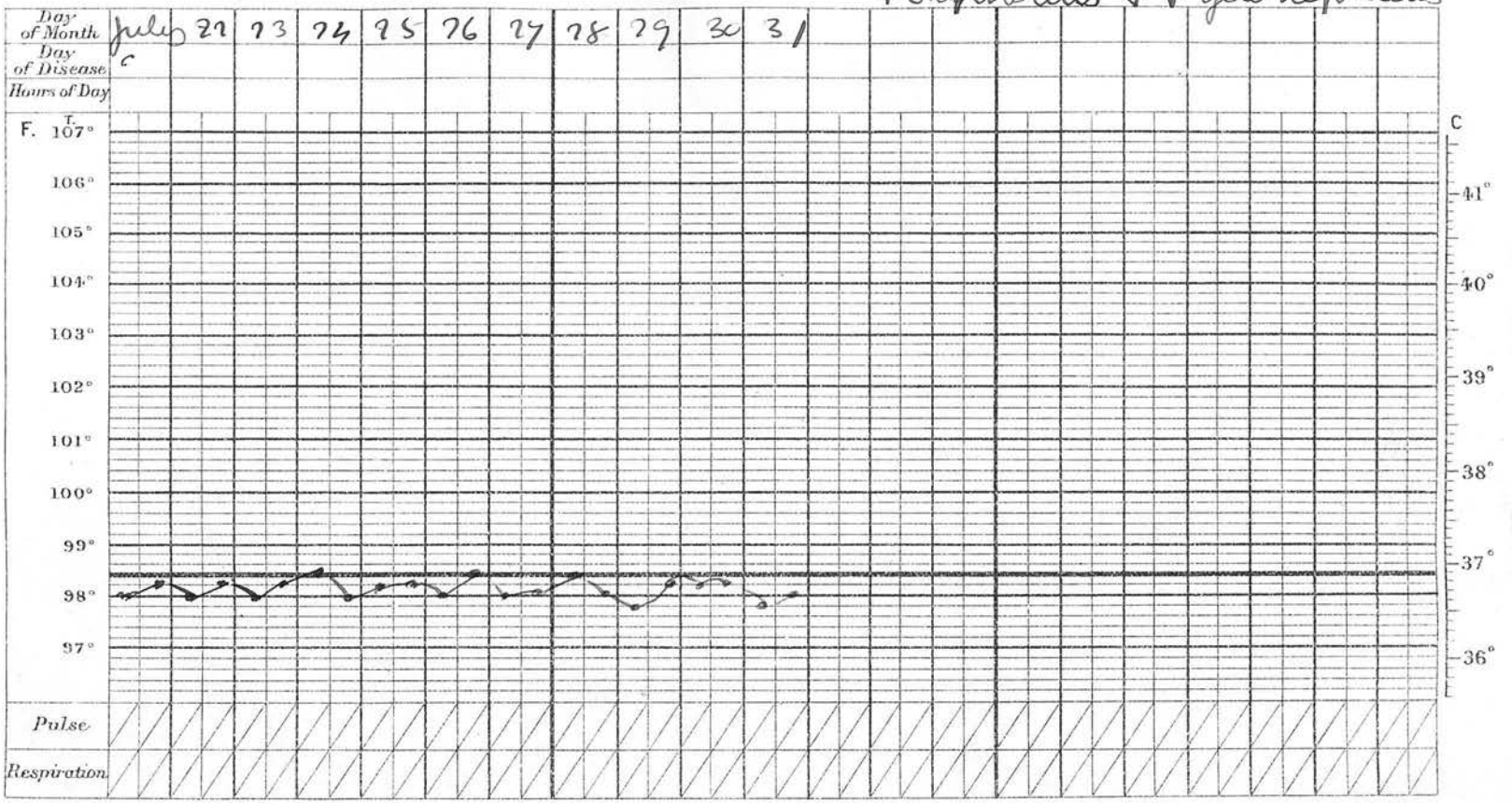
Under Author's care at Women and Children's Hospital, Leeds. Is a very typical case of Post-operative L. sided pyelitis developing after an operation for removal of R. Cystitis Ovary and L. Ovary and tube which were densely matted together and adherent to the L. side bowel and rectum.

The handling of bowel and prolonged operation no doubt was the cause of B.C.C. getting into blood stream and causing Pyelitis. Of course this may have been an ascending infection through B.C.C. getting into bladder directly.

The fact that Pyelitis may occur after any operation within the Peritoneal cavity, should make the surgeon chary of handling

Case 130 Post Operative Pyelitis

Name Female Age 25. Disease Double Salpingitis + Oophoritis + Pyelonephritis Index No.



the intestines with any degree of roughness. Many post-operative conditions and neurasthenia with complaint of pain on one side if carefully examined would I am sure reveal a chronic R. or L. pyelonephritis.

Case

X F. age 38, left sided pyelitis developed Post Operative.

18.6.08 Operation for R. Ovarian Cyst and left sided Pyo-Salfrinx. Anaesthetic, ether. In the left blood ligament there was pus. All the symptoms and pain were confined to the left ovarian region. But just before admission she stated that she had a cutting pain just before passing water. Lasted 3-4 days and then passed away. Urine, no albumen, deposit of urates, acid. There is no note as to microscopic examination.

Progress of case.

26.6.08 Patient suffered from an attack of Ether pneumonia Bronchial breathing heard L. lung posteriorly. Secretion was free and cough was very troublesome. Temperature now settling to normal.

27.6.08 Stitches removed. Good result, primary union. Patient better, coughing less.

3.7.08 Patient vomited this morning a quantity of bile-stained fluid. Complained of pain in left side of chest and also pain in the leg. Thought to be neuralgic. Gave her

Pot. Brom. grs. XV
Phenacetin grs. V

Y6.30 p.m. T. 104, P. 122. Patient stated that she was much more comfortable but still had pain in L side of the chest. No definite physical signs of lung trouble. Wound dressed. Quite normal. No local tenderness.

4.7.08 Thought that some friction sounds were heard. Pain complained of on deep inspiration.

5.7.08 Pain better. No pleuritic rub heard and no physical signs of pneumonia.

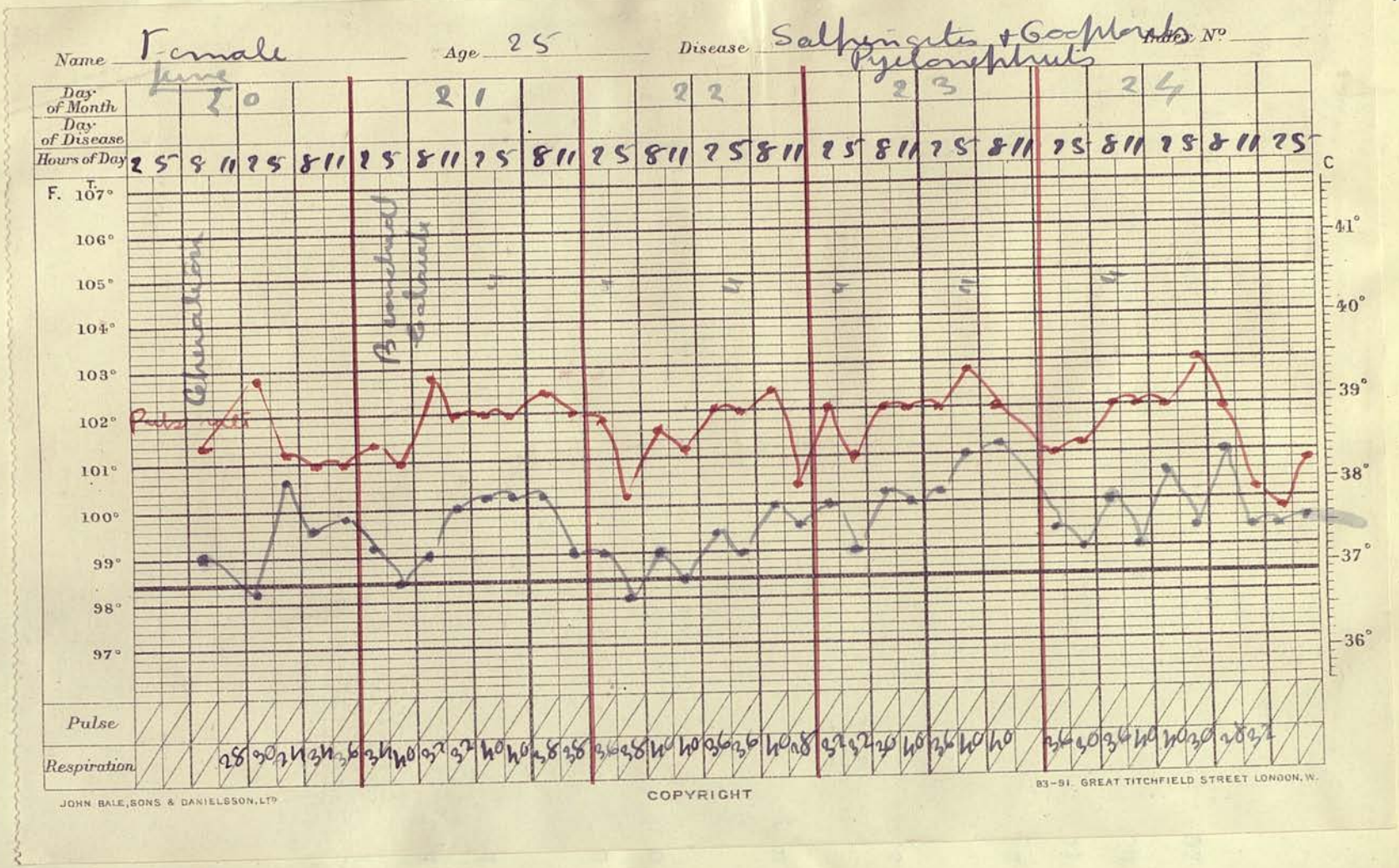
8.7.08 Urine examined, Sp.G. 1015, acid with heavy deposit of urates and pus. Microscope, numerous pus cells. Few triple crystals and many mobile bacteria. Culture, B.C.C.

9.7.08 Urine, Sp.G. 1008, acid and as before. Report of Pathologist and also now definite local tenderness over the Left Renal region that enabled one now to definite diagnose Left Pyelitis.. Treatment of urotropin and plenty of fluid given, and Pot.Brom. and Hyocyanic for the pain, patient gradually recovered.

28.7.08 Urine Sp.G. 1010, acid, deposit of pus decreased to a very small amount. Temperature normal. Numerous mobile bacteria still in urine.

Note the different rates of pulse in medial cases post Operative + when that had Ether Bronchitis + when Pat. had Pyelitis i.e 120 - to 128 + B C (infective comparatively slow

Case 130 Three hourly Chart- Post Operative. Ether Bronchitis i.e 120 but more usually 100



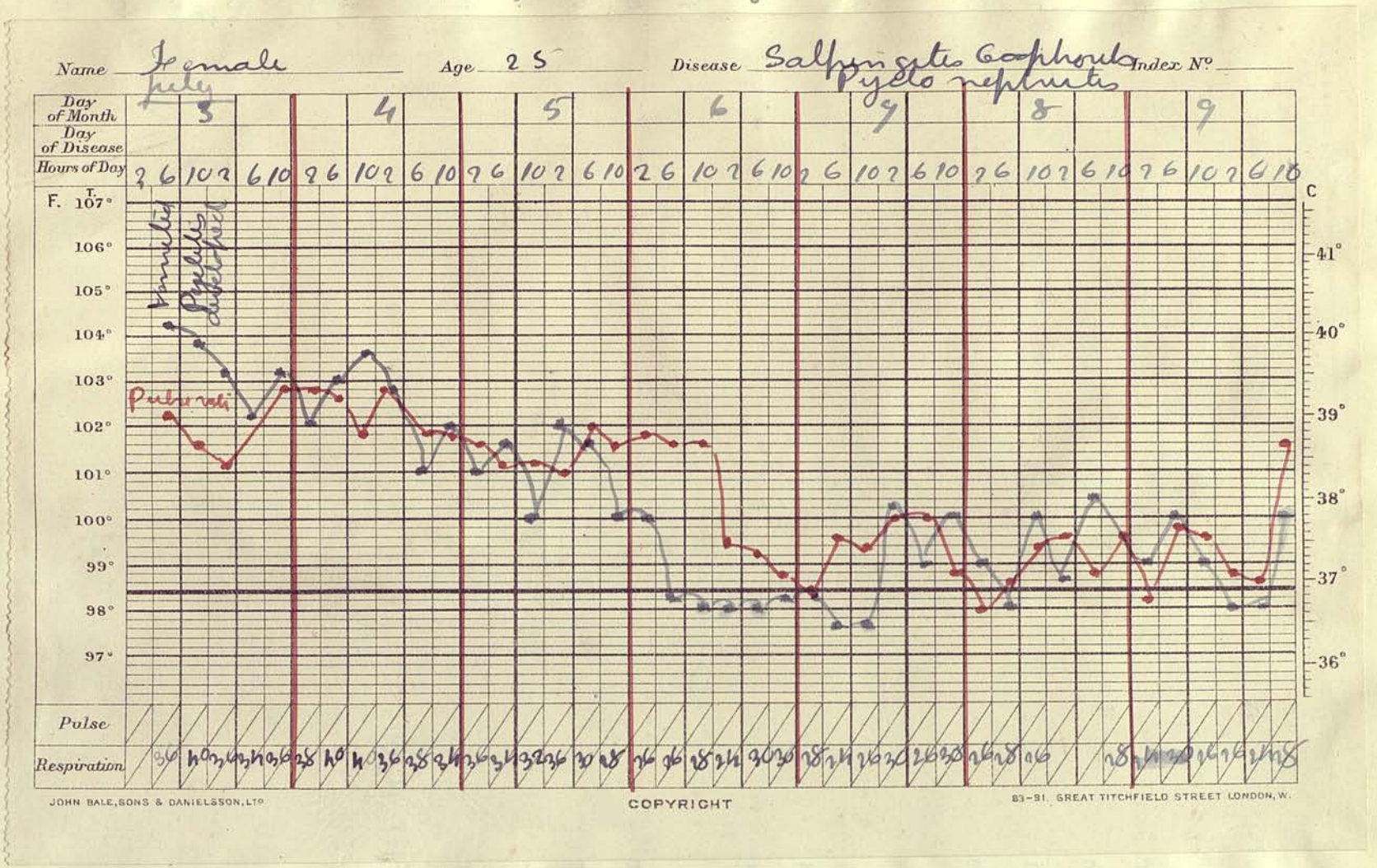
1.8.08 Discharged. Left feeling very well. From July 3rd and 8th T. 104 - 101, gradually settling. Pain and tenderness over L. kidney regions, and L. loin, the pain also spreading down the leg. Urine acid, Sp.G. 1010. Pus still present but diminished in quantity. Microscope, numerous mobile bacilli present.

Temperature before discharge normal for 12 days.

Note. That the acute onset came on with vomiting and a rapid rise of temp. to 104. It was difficult at first to decide whether patient had pleurisy, as the acute pain simulated it. The subsequent development of renal pain and the examination of urine proved the illness to be due to acute Pyelitis, possibly a recurrence. Patient was alcoholic and probably had previous attacks of pain which she described as "pains in the side." There is also the thought that the Pyo-Salpinx was gonnorrheal in origin, but as there was no bacterial examination made of the pus and tube one cannot be definite on this point. The life of the woman suggested that she had had this disease.

Burnett (Transactions of Edinburgh Obstetrical Society Vol.XXXV 1910-11) points out the fact that onset of Pyelitis may simulate pleurisy and the recognition is difficult, but renal tenderness and examination of urine will clear up the diagnosis.

Case 130. Fever Charles Effect of Pyelitis
Post Operative Pyelitis



COLITIS DUE TO B.C.C.

Case 105

X Seen and watched by Author at S. Devon and E. Cornwall Hospital, under Dr. Fox, 1911.

Vaccines 30-60 million per dose. Her chief complaint was Colitis off and on for many years She was about 3-4 months pregnant at the time she was first seen. On discharge from Hospital she was much improved. I have no record of her subsequent progress.

Doubtless many cases of Colitis if carefully examined would show B.C.C. in the urine.

Case 127

Reported by Dr. Crowe. Combination of Pyelitis and Colitis. Certainly improved under vaccines and only relapsed when overworked.

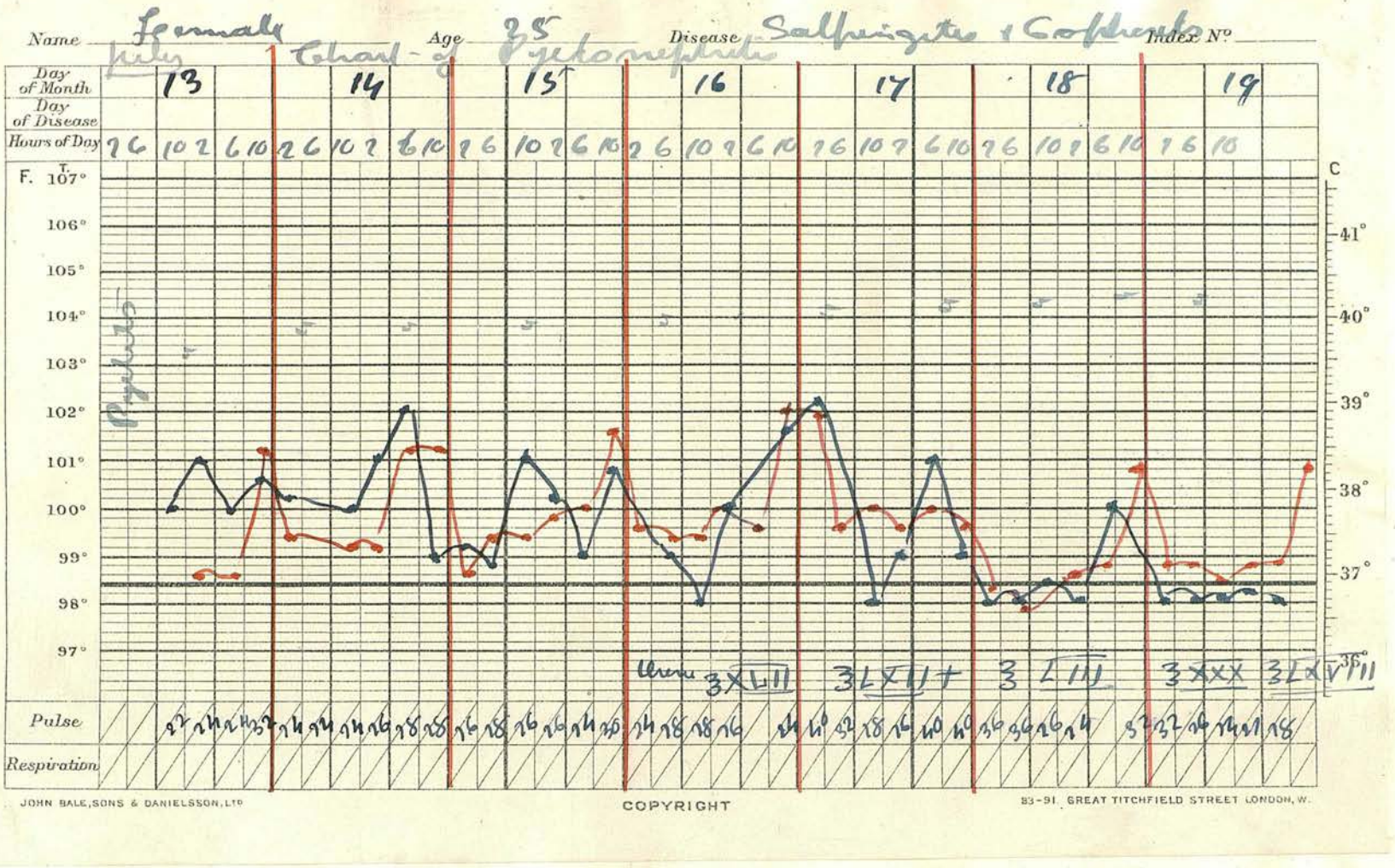
GENERAL SEPTICEMIA.

Under this heading I have been able to collect the following two reports of cases of generalised septicemia in which B.C.C. was found in blood and also in sputum.

Gilman Moorhead in an article in the "Practitioner," 1905, p. 770, entitled "The Bacillus Coli as a cause of Septicemia," described a similar case which he puts down as a B.C. infection and very well supports his case, but he was never able to obtain the

Note Pulse Rate comparatively slow

Case 130. Pyelitis (continued)
Post-Operative Pyelitis



B.C.C. from the blood, but obtained it from the blood post mortem. The case quoted was that of a male age 37, and illness lasted 126 days (4 months), and just before death pulse rate was 34 and respirations 6-10 per minute. B.C.C. was obtained post mortem from (1) Cerebro spinal fluid, pure culture B.C.C., also a diplococcoid organism. (Pneumococcus)

(2) Blood from heart gave similarly B.C.C. and diplococci

(3) Spleen, Pulp do. do. The diplococcus ultimately proved to be a pneumococcus of low virulence.

(4) Sections of tissues showed Bacteria. In the intestinal walls many bacilli, some gram staining and some non gram staining, Numerous cocci.

(5) Liver, kidney and Suprarenals and Spleen as above.

(6) No organisms in the heart wall.

(7) In the meninges of the Brain and just beneath the pia mater were numerous non-gram staining bacilli and also a few Diplococci. No organisms were obtained from the Ependyma. This non-gram staining organism was presumably the B.C.C.

Gilman Moorhead quotes the following cases.

(1) B.Coli septicemia. Reports of cases presenting during life septicemia symptoms, and in which B. Coli was found in the peripheral blood during life.

(2) A case reported by Hencher in 1901 in which death re-

sulted from septic ulceration of the Aortic valves. During life the B.C.C. was isolated in pure culture from the blood in the early stages of the disease, while later on streptococci also appeared. Quoted by Königer, H. Histolog.(Utersuchungen in Endocarditis.)

(3) Suredez reported in 1895 a case of general infection with B.C.C. during an attack of influenza, in which the Colon Bacillus was obtained from the Spleen during life.

(4) Kavalewski and Moro (Klin. Therapeut Wochenschrift, 1901) give two fatal cases in children in which the B.C. was obtained from the blood during life, and while colitis was found post mortem.

(5) Sittmann and Barlov (Deutsch Archiv fur Klin. Med. Bd. 52, heft 3, 1894) a case of general B.C. septicemia following a local infection of the urethia. The B.C. was found in the blood during life.

Autopsies during the past 15 years. The B.C.C. has frequently been found in abdominal organs post mortem, and also but less frequently in the cardiac blood, and according to the opinions held in regard to the significance of this fact, bacteriologists may be divided into the following groups:-

(1) Those who regard the presence of the bacilli as due to post mortem invasion of the tissues through the intestinal walls.

(2) Those who believe that the organism first gained entrance to the body during the so-called Agonal period, which immediately precedes death.

(3) Those who believe that the B. Coli may invade the body during life, either through the diseased or healthy intestines, and either itself producing a septicemia modify the course of a previously existing septicemia, or prepare the way for a septicemia to be caused by some other organism.

Further reference to Gilman Moorhead's Article will give the references by which he supports the view that the B.C.C. can produce a Septicemia.

GENERAL INFECTION WITH B.C.C. PRODUCING DOUBLE PNEUMONIA AND PURULENT BRONCHITIS.

Dr. R.C. Kemp (Boston Medical and Surgical Journal, Nov.30, 1911) has reported a general infection with the B.C.C. in which double pneumonia and purulent bronchitis was produced.

A man aged 44 operated on on March 2nd /10 for R. Inguinal hernia at New York Hospital, he was in perfect physical condition and his organs were found normal on examination. Though he took much exercise he was subject to constipation, for which he used olive oil and other simple remedies.

On the afternoon of the day of operation catheterisation was

necessary. On the next day there was some irritation of the bladder, which was washed out. On the following day there was pain in the L. renal region and the urine contained pus. Pyelitis was diagnosed and urotropin was given. In 3-4 days the pain disappeared and then the R. kidney was affected, but not so severely as the left. The pain on the Right side soon disappeared, but pyuria and slight pyrexia continued. On March 11th he complained of pains in the right side of the chest, and on the 12th day pleurisy was found. On the 14th a small pneumonic area was found at the right base. On the 16th there was an alarming attack of heart failure with a fall of temperature.

Under digitalin, strychnine, hypodermic injections of camphor in olive oil, hot stupes, and inhalation of oxygen he rallied. On the 24th there was a rigor, and the temperature rose to 104° F. As there was still evidence of pyelitis this suggested infection with B.C.C., which was found in the urine in large numbers. Resolution of the lesion in the right lung was very slow. There was little sputum, but in it abundant colon bacilli were found. Early in May a sharp attack of colitis occurred. Subsequently an attack of pneumonia at the left base with mild symptoms took place. The B.C.C. was again found in the sputum.

In May a sudden attack of acute purulent bronchitis occurred. So thick was the pus that a pulmonary abscess was feared. On culture enormous numbers of B.C.C. and some streptococci were found. As there was still pneumonic expectoration it seemed that the bronchitis was due to infection from the pneumonia. Under autogenous vaccines the bronchitis improved, but the B.C. persisted in urine.

In June an exacerbation of the pyelitis occurred, and coincided with a second attack of colitis, and a very suggestive fact. Ulcer of the colon was suspected, but examination of the stools for pus or occult blood was negative.. In July the bacilluria with a few pus cells still persisted, and the evening Temperature was 99 to 99.5 F. On Aug. 7th the urine was found free from B.C. It remained so until October, when the patient returned to business. Against advice he did a full day's work. About the 4th day he had a chill and rise of temperature and B.C. reappeared in the urine, but not in great numbers. He was then sent to the S. of France. In December he wrote that only a few B.C.C. could be found in the urine and that his temperature was normal.

Throughout the illness urotropin and sodium Benzoate were given, at one time 80 grs. of each daily.

EYE INFECTION AND B.C.C.

Cases 106)
107)
111
118 Two cases of metastatic ocular inflammation associated with B.C.C. Toxemia.

These cases I regard as the most interesting of all that I have referred to. They point the moral often emphasised in this paper of the need that Bacterial investigation of all urines should be carried out, especially with so-called Toxemic failure of vision.

Case 106

Was a bad case of R. Papillitis and Retenitis and loss of vision in a female age 21. After two months vision $\frac{6}{12}$ with Blind sector and eventually able to read $\frac{6}{5}$ easily except at blind sector. This case had no urinary symptoms nor any localising symptoms and it was a chance reference of the chambermaid that the patient's urine was foetid that drew attention to the urine, and an examination proved B.C.C. to be present in pure culture. Under Helmetol and rest patient made a splendid recovery. (Transactions of Ophthalmological Society, Lawson, 1911)

Case 107

Recurrent Vesicular Keratitis. F. age 36. Under ordinary treatment Keratitis recurred. Finally after a scraping of cornea a very purulent Keratitis set up and Dr. Lawson almost despaired of saving patient's eyesight. Examination of urine was made

and B.C.C. found in pure culture. Autogenous vaccines prepared and effect was remarkable, and patient ultimately recovered with vision as before, R.V. $\frac{6}{9}$ L V. $\frac{6}{36}$ Lawson, Transactions of Ophthalmological Society, 1911)

Case 118

At the Plymouth Eye Infirmary I am at present watching a case of failure of eyesight with dense haemorrhages into R. eye. The patient looked toxemic and examination of his teeth revealed Pyorrhoea Alveolaris. He did not improve after their extraction, Examination of urine proved B.C.C. to be present in pure culture. Under vaccines and general medical treatment he is improving generally, but one fears that recovery of sight will not occur, as with such dense haemorrhages into the vitreous and possibly Retina no view is obtainable, no recovery of sight is possible.

This man gave no history of any genito-urinary trouble. Specific+Gonorrhoeal History was also excluded. He exemplifies the B.C.C. infection without urinary symptoms. Possibly one could get a complaint of occasional lumbago.

Case 111 Watched at S.D. & E.C. Hospital by author of Thesis

Female age 21. Work, Seamstress in Factory. Gave an interesting history of being seized with severe headache and pain in back, and four days later developed blindness in both eyes. Ten days after onset of illness removed to S. Devon Hospital.

On admission an indefinite hisotry of occasionally puffiness of legs, not much, and had headaches. Had been feeling quite well otherwise up to onset of illness. No urinary trouble symptoms . Eyes a typical picture of Albuminuric Retenitis. Patient could only perceive light. Pupils were widely dilated and equal.

Diagnosis, Albuminuric Retinitis and Haemorrhage into Vitreates. Urine, acid, pus and contained a trace of albumen. Culture proved B.C.C. to be present. Result, vaccines given every 10 days Vision did not improve, but general condition did. B. C.C. disappeared from urine.

These four cases support the view of a general spepticemia or Toxemia affecting, and are of intense interest to the Ophthalmic surgeon. They exemplify the distal effect of the B.C.C. and its toxins and might explain many other cases of simple failure of eyesight described under the heading of Toxic Amblyopia.

When eye structures are destroyed by Haemorrhage etc. no amount of vaccine or other treatment can restore structure so destroyed.

A letter by Kenneth Campbell, London W., B.M.J. July/10 states that among other causes of ritis one may reckon "Oro-alimenatary (presumably he means B.C.C.) infection" and apparently Lawson accepts this view that B.C.C. may be a factor in eye disease.

NOSE (SINUS CASES)

Lewis reports (Suppuration of Accessory Sinuses of the Nose, C.J. Lewis M.D., Journal of Pathology July 1911) that he has found the B.C.C. in antrum and frontal sinus and it might be a possible explanation of Eye infection previously referred to that in certain cases this B.C.C. sinus infection may travel through lymphatics or blood stream. The point is not settled yet whether sinuses are in the care of the Ear, Nose or Throat Specialist or Eye Specialist. The Eye surgeon may or may not seek to examine the sinuses of such cases as Lawson quotes and he does not state that he sought in the sinuses for the B.C.C. It might be of benefit to the patient if such complete examination were done.

SKIN INFECTION.

Case 120. Bulbous 6nchyia, Cured on giving a B.C.C Vaccine.

121. Chronic ulcer of leg. 2 years surgical treatment no avail. Cured on having B.C.C. vaccine.

123. Ischic rectal Abscess. Would not heal at first. Healed up on getting B.C.C. Vaccine.

TREATMENT OF B.C.C. INFECTIONS, GENITO-URINARY.

ACUTE CASES. General. Rest in bed, milk diet, bland unirritating laxatives, no vigorous purgatives. Application of heat to the loins if pain and if much cystitis over the hypogastrium. Drugs. IN Children Pot. Citrate seems to be of great value in doses of 20 - 40 grs, or more, 3 - 4 hourly until the urine becomes alkaline, which takes 4 - 5 days to do.

Urotropin and Helmetol are of value in many cases. Dr Newman (Glasgow) seems to think that in those cases where it produces irritating effects, possibly due to the irritation of Formaldehyde, if combined treatment of Pot. Citrate and alkalis with urotropin be used, this difficulty is got over.

Dr. Anson Jordan M.D., F.R.C.S., in a letter in Lancet, Mar. 19, p. 684, seems to think that the above reasoning is faulty, and that one should not endeavour to render the urine alkaline, but rather more acid than it already is. He supports his opinion thus. "Experimental work that is being done (the results will be found in the Bio-Chemical Journal, Vol.IV, No. 6 & 7, and the most recent Transactions of the Section of Royal Society of Med. Surgery and Pharmacology) is against Dr. Newman's view in referring to the giving of Urotropin and Helmetol in cases of mild B.C.C." Infection where the urine is acid, as in B.C. infections formalin

is liberated from these preparations, and creates irritation, but if the urine be rendered neutral by potash or lithia salts this difficulty is overcome." These words seem to imply that Dr. Newman considers that the liberation of formaldehyde by an acid urine is in the nature of an incident not desirable in itself, and which it may be desirable to prevent. As a matter of fact there is I think not the slightest doubt that these drugs act slowly by the liberation of formaldehyde, and are not in themselves antiseptic. This liberation as Dr. Newman says, only takes place in an acid medium, and in consequence to render the urine alkaline is to render urotropin and helmetol of no effect, and they may as well not be given. Further under the heading "Chronic Cystitis" the alkalis and alkaline salts are indicated. This is a generalisation of the statement so often made that in B.C. infections the urine should be rendered alkaline, because alkaline urine inhibits the organisms of this class. This inhibitory power exists, but it is comparatively slight and negligible compared with the very great antiseptic power against B.C. in an acid urine plus urotropin, so that I am decidedly of the opinion that in these infections the aim should be to increase the acidity as much as can be tolerated by the patient, giving urotropin in conjunction, and the few cases in which I have been able to apply this principle the results have been borne out.

Jordan goes on in his letter to say, "In conclusion I should like to say how pleased I have been to read Dr. Newman's praise of Boric Acid given by the mouth as a urinary antiseptic, since I have found in laboratory experiments that at any rate it is quite efficient and is indeed the only effectual drug in alkaline urine, while its use as a urinary antiseptic at all is by no means generally recognised."

If reference be made to Dr. Klein and Dr. Julius Bernstein's experiments on the effect of Boron on the life and growth of B. C.C. and B. Gaertner referred to under Pathology, and the original reference, Medical Annual 1911 p. 706, some support is given to the view that Boracic Acid may reasonably be expected to have some effect upon the B.C.C. in the bladder and kidneys.

Dr. Newman says that he has found that it is most useful when the kidneys are not involved and the inflammation is limited to the bladder, but when the kidneys are involved it upsets the digestion.

Personally I have found Boric Acid of not much use, and in one case its use caused a very marked increase in pus etc.

Helmetol is better than Urotropin, but the action of both must be watched, as it differs in different cases. Sometimes they suit admirably and then act as irritants. Dr. Newman suggests that it is the ammonia salts of formalin acting in an acid urine and setting free Formaldehyde. If the urine be ren-

dered neutral or alkaline by potash or lithia salts this difficulty is overcome.

At the present moment I am treating a case of B.C.C. cystitis subacute, whose chief symptom is frequency and a stinging pain after the act of micturition. If she be given Urotropin alone the symptoms certainly improve, but if for cheapness sake she takes about 3ʃ of Soda Bicarb. at night, and does this steadily, she says that after 2-3 days she loses the stinging pain. This case rather supports Dr. Newman's contention that the urine should be rendered alkaline. The question whether formaldehyde is not liberated in an alkaline urine as stated by Dr. Jordan requires some practical work which I have not been able to do.

If reference be made to Dr. Burnett's article it will be found that in his acute cases Urotropin was disappointing. This conclusion is also supported by Dr. Newman and in my own clinical experience the best results from the use of urotropin are obtainable in subacute or chronic cases of infection especially of the relapsing variety.

Bladder Sedatives are also useful, i.e. Hyocyanus and general sedatives. Phenacetin, Asperin, Chloral and even Morphia, Pot. Brom.

Local Treatment. Bladder irrigations are of great value and under scrupulous antiseptic and aseptic methods are the means of relieving spasms and stranguacy in the vesical cases. I quite agree with Dr. Newman that their use in the earliest onset of the illness is extremely valuable.

Sterile water, weak Boracic or Permanganate I have found of great service.

Note. (In an article by J.H. Sanders B.M.J. Mar.16,12, p. 605, some cases of Boracic acid poisoning, with use of grs.5 of Boracic acid by mouth every 4 hours, are given. They developed a severe drug rash. Also a case where Boracic Acid poisoning used for a rectal wash-out. The case previously quoted in which I used grs. X by the mouth 3 times a day also proved to me that Boracic Acid may act as an irritant when given by the mouth and excreted by the kidneys into bladder.)

Vaccines are of value in acute cases and many cases have been reported as cured, i.e. urine become bacteria free, with their use. The subject of Vaccine Therapy will be discussed later on in this paper.

CHRONIC INFECTION.

Drugs. Urotropin and Helmetol are extremely valuable.

Purgation. Mild laxatives, no strong purgatives, as it is natural

to suppose, if we accept the view that abnormally mucosa permitting the exit of B.C.C. from the alimentary canal into general circulation, a mild enteritis may accelerate their exit.

Salol is worth a trial, as also setting free salicylic acid and carbolic acid and acting as an intestinal and urinary disinfectant. $CuSO_4$ is used in America How it acts I do not know.

Local Measures.

Bladder irrigations of sterile water, boracic and even silver nitrate, 1-2 grs. per ounce after washing out the bladder with sterile water and emptying it. In a child 3 ounces may be injected and left in the bladder. As soon as the urine flows into the bladder the silver salt becomes combined with chlorides and forms an insoluble salt.

When the vesical ends of the urethia or the mucous membrane of the canal is involved the duct should be dilated freely, a speculum introduced and the whole passage swabbed with pure c arbolic, and immediately washed with a solution of bicarbonate of soda to check the action of the carbolic acid. The pain that follows is sometimes severe for the first few days, but it is easily relieved by cocaine suppositories or morphine, and generally in a week or 10 days all the troublesome symptoms have disappeared.

IN CHRONIC PYELITIS,

Drug treatment may help, but it is difficult to imagine how drugs are going to do so, except as they apparently do by lessening the number of B.C.C. excreted.

General measures of intestinal antisepsis and general hygiene are of some help.

A case that has once had Pyelitis diagnosed I should regard as in a stage of infection that is difficult to eradicate.

In America some attempts have been made to wash out the pelvis of the kidneys, but the procedure is difficult and not at all likely to become generally used as its use is naturally limited to experts.

From what has been learnt it is quite apparent that many cases of Chronic Pyelitis have acute exacerbations, possibly preceded by some intestinal disturbance, and under general methods of rest, bland dietic and mild dinretics the clinical symptoms have subsided.

Vaccines in some cases have proved of service. Many cases of Chronic Pyelitis have responded to no treatment and ultimately have had to be surgically treated by Nephrectomy, Decapsulation or Nephrosis, and at the operation calculi have been found. Relief of symptoms has followed, but even then Bacilluria has persisted beeause the other kidney may have also become affected.

Cystotomy and Pubic Drainage have also proved of service in the more chronic cases, and in one case where the bladder was badly diseased owing to a vaginal fistula which could not be closed, a Leeds surgeon successfully planted one ureter into the rectum. He was unable to identify the other ureter and decided that it was not functionating.

PREGNANCY PYELITIS.

This condition is now recognised as a clinical entity, and is serious enough sometimes to warrant the interruption of the Pregnancy if the general symptoms are at all severe. It is remarkable to note the dropping of the temperature to normal in an acute case, after the abortion is over, and also how quickly the urine clears up as regards the amount of pus.

Cases of pregnancy Pyelitis should be carefully treated, with rest in bed, fomentations and if cystitis is present, local treatment of bladder irrigations. At first use Pot. Citrate and then Urotropin and Helmetol.

In these cases lavage of the bowels is very useful. Many cases if carefully treated and disease is recognised early, with adequate treatment may be tided over and reach full term, and have a normal puerperium. My own rule is to ask for a specimen of the urine at the date of any midwifery engagement, and to examine it carefully for the usual albumens, blood etc., but also to test for Indican by the following simple test:-

Test - Place an inch of urine in a test tube and add an equal part of strong Hydrochloric Acid. A pink to a red colour is obtained if Indican is present. If the colour does not come at once a few drops of strong Nitric acid may bring it up. This attracts my attention to the possible presence of B.C. I allow the urine to stand or centrefuse it, and examine by the microscope. The B.C. is seen as numerous clumps of mobile organisms of varying sizes. Specimens are examined every month and then weekly in last month.

In some urines the sediment has been thought to be pus, urates, by naked eye inspection, and then on microcsopical examination these numerous clumps of bacilli are seen.

A catheter specimen is then obtained and submitted to culture, In all the cases in which I have thus suspected B.C.C. to be present, the subsequent culture verified their presence.

Unfortunately in a certain percentage of cases, the general toxemic symptoms are severe and the pregnancy terminates naturally and the ovum is expelled, or an induction has to be done after consultation. The further advanced the pregnancy the more likely abortion is to occur. Usually these cases have been noted to develop symptoms between the 4th and 6th month. All the records I have read describe these cases as Acute Pyelitis in Pregnancy. My own feeling is that if the history were ascertained, nearly all these cases have had some previous B.C. infection,

either in youth, or have had what has been described as Rheumatic pains, i.e. influenza with backache temperature, or lumbago.

I have seen a case after a severe bout of seasickness develope so-called acute rheumatism, the patient gave no history of chill as she never experienced any cold. She developed acute backache and temp. 102°. Under usual salicylate treatment she recovered. At a subsequent date the same patient again developed backache and temperature and again this was accompanied by no history of chill, but of slight constipation. Examination of urine found acid and B.C.C. In my view many so-called especially the so-called lumbagos Rheumatic cases may be traced to a recurrent B.C. infection. The above patient had no micturition symptoms, but gave an old history of bladder infection after catheterisation subsequent to an operation for appendicitis.

POST PARTUM PYELITIS.

This again should be recognised and watched for ; if the urine has been carefully examined previous to parturition, symptoms of pyelitis may be prevented. Prevention of constipation should be aimed at and every endeavour made to prevent a state of paresis of the bowels, which is often regarded as a normal sequelae to parturition. Personally I am much in favour of giving a dose of castor Oil the second night after birth of child, and next day and every subsequent day doses of Cascara.

The Lochia in these cases becomes foetid and the patient may describe it as black.

In addition there may be some retention of the urine and I have been extremely annoyed in some cases to find a distended bladder where I have received a report from Nurse in charge that ample urine has been passed. These cases are most suited for intra-uterine douching. In slight infections one douche may be sufficient.

Treatment by Quin. Sulphate grs X for three doses and then grs. V for next three doses, will clinically abate the symptoms. The Quin. undoubtedly has a bactericidal effect.

The prognosis for these patients must be guarded as to subsequent attacks, as a subsequent pregnancy will light up the infection, but under proper medical care a normal pregnancy and puerperium may be secured.

NEPHRITIS.

I have seen several cases of typical chronic nephritis with B.C. in the urine. Oedema. Albumen. Three cases were treated with vaccines and improved to a certain extent, but subsequently all relapsed, and they were treated under the usual medical lines.

These cases raise the thought, is Nephritis after all a disease due to the infection of B.C. and its toxins ? I think other observers have noted the occurrence in ordinary nephritis of B. C.C. in the urine.

Cases 108, 109, 110, 111 all were diagnosed clinically as Nephritis and in all the B.C.C. was found in the urine. They did not permanently improve and were marked as incurable. One case died.

TUBERCULOSIS AND B.C.C.

The usual medical remedies may be used and some cases are relieved. A certain number have had more relief from a combination of B.C.C. vaccine alternately with Tuberculin, and there are records of some symptomatic improvement.

Case 62. Shewed some improvement, though he ultimately died, with Tuberculous Pneumonia.

Case 66 certainly improved, but the T.B. and B.C.C. persisted though in less numbers.

Case 117 improved for a time but relapsed.

As the use of Tuberculin is yet in its infancyit isa remedy about which one has yet to learn the use and limitations. The work that Dr. Carmac Wilkinson, London and Melbourne, has done in advocating its use in tuberculous lesions seems to suggest that the doses used in treatment have been far too large, and that a proper immunising process has not been undergone by the patients who have been Tuberculin-treated and found to derive no benefit.

Almurwroth Wright and Osler and others declare that they do not regard Tuberculin as of any value .

Of course in all tubercular infections, this combined infection with B.C.C. included, open-air treatment is useful. Probably these cases will not be cured, as tuberculosis of the genito-urinary tract is usually associated with tuberculous lesions elsewhere. But in a mixed infection the above treatment of Tuberculin and B.C.C. vaccine is worth a trial.

GENERAL SEPTICEMIA.

As I have pointed out, I have only been able to find two records of a general septicemia. Both were very long illnesses and apparently began acutely. One died and no treatment availed, and the other survived with a persistent bacilluria. The main lines of treatment were adequate nursing, use of urotropin and general hygiene. Such cases are of grave prognosis. Many previously, unexplained "Remittent Fevers" may be due to this specific infection.

Three cases of RHEUMATOID ARTHRITIS which I have had reported me all shewed the B.C. in the urine. An interesting observation is made that in these three cases the first symptoms of Rheumatoid Arthritis developed subsequent to the first pregnancy. No examination of the urine as to presence of B.C.C. was made at the time of this pregnancy. It was only after, in two cases

the second pregnancy, and in the other the third pregnancy, with the progress of the symptoms of Rheumatoid Arthritis, that the urine was examined and found to contain B.C.C.

Vaccine treatment offers a certain field, but when joint changes have occurred one fears little will avail.

EYE CASES.

These cases - 106, recovered under treatment by Helmetol,

107, recovered after ordinary treatment had failed, and vaccines proved of great value, so that patient after passing through a serious illness returned to her usual state.

Case 111. Attention frawn by above cases and B.C.C. found in the urine. Vaccine proved of no avail, though general health improved under general medical treatment.

These cases are interesting as pointing out the need for careful examination of urine in eye cases, and detecting the presence of the B.C.C.

Not a suffieient number of cases have been watched and described for one to be able to judge the specific effect of the B.C.C. and its toxins upon the general system, and upon the special sense organs, in the way that the poison of Nicotine produces the so-called Tobacco Ambyopia; but if one poison can do this, there is no reason to doubt that the B.C. with its wide variation of species, and clinical effects, may be able to produce a B.C. Ambyopia, probably by means of its toxins.

Many an Ophthalmologist has noted that cases of Iritis recover under simple treatment of Haustus Magnesium daily, thus pointing to the alimentary canal as the source of infection. The Ophthalmic surgeon does not regard all cases of Iritis as of specific origin. Hence the interest of the above notes on B.Coli as a definite causal factor in eye disease.

Vaccines.

As far as the literature goes that I have seen, I am inclined to think that Vaccines have a place, espedially for the milder and acute cases, but other therapeutic measures should be adopted also. When one considers that the probable effect of these vaccines - and preferably they should be "autogenous" - is to promote the body resistance, so as to overcome in a natural way the infection by which the body is invaded, one can see that there is a place for their use, provided that the case is one that is capable of being so stimulated. The difficulty of course is to know what cases are going to react. A Chronic infection which has existed many years has frequently been over-stimulated, hence is not capable of responding to this "immunising" treatment. Hence the value of vaccines in these cases is small. Young people with vigorous natural immunity are most likely to respond to vaccine treatment.

An analysis of the cases quoted in this paper will support this view.

Out of the 132 cases analysed in this Thesis -

104 were treated with Vaccines, and frequently other Medical treatment was used in conjunction, so that it is difficult to say whether all the result was due to Vaccine Therapy.alone.

In only 10 cases did the urine become ultimately Bacteria free.

The cases quoted are:-

Case 3	Vaccine only.
5	Vaccine and repeated intra-uterine Douches.
45	Vaccine only
46	Vaccine and Copper Sulphate
47	Vaccine and Urotropin and Bladder Irrigation
51	Vaccine Irrigationwith Boracic, Urotropin
52	Vaccine, post operative.
55	Vaccine and Copper Sulphate
65	Vaccines
113	Vaccine Post Op.

In only 3 of the above 10 cases was Vaccine used as the sole treatment, a combination being used in the other 7 cases.

Symptoms improved in many cases out of the 104 treated with vaccines combined with other means.

It will be found on analysing these cases that out of the 132 cases quoted,

71 received Vaccine Therapy only.

Of these 71 cases,

only 5 are recorded as cured by Vaccine Therapy

6 cases, no cure (2 died, No.126 of Tuberculosis, No. 62 of Tubercular pneumonia)

60 cases improved under vaccines but B.C.C. persisted

71

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In 25 cases, Vaccines were used in addition to other medical treatment. These cases frequently remained stationary and did not improve.

In Operation cases, 10 cases are quoted.

7 Cases Post Operative and Vaccines. Of these -

2 cases became bacteria free

4 " " symptomatically well but B.C.C. persisted

1 did not improve at all

-

7

-

2 Cases of operation without other treatment, became Bacteria free.

1 Operation with ordinary medical treatment, became symptomatically well but B.C.C. persisted.

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10

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26 Cases received medical treatment only and symptoms were relieved, but Bacilluria persisted.

Operative Treatment.

In 10 cases Vaccines were given after the various operations, and 5 became ultimately bacteria free, and credit must no doubt

be given for result as much to effect of operation as to Vaccine; but the vaccine had the effect of healing up things more quickly. Three of these cases had Vaccines, Two no Vaccines Post. Op.

Cases		
	Cures	
" 5	Curettage and then Vaccine used.	Urine Bacteria free
" 52	Operation Appendectomy and then Vaccines Post. Op.	Urine Bacteria free
" 113	Nephrotomy	Urine Bacteria free
" 115	Nephrectomy	Urine Bacteria free
" 57	Nephrostomy and Vaccines	Bacteria free for a while and then B.C. C. present as slight growth
	Improved	
" 58	Nephrectomy and Post.Op. Vaccines	Improved but B.C. C. persisted
" 130	Removal of Ovary and Tube (Salpingitis etc) and Medical Treatment	Improved but B. C C. persisted
" 129	Appendisectomy and then Vaccines	General effects good, No note as to effect on Bacteria
" 66	Nephrectomy and then Vaccines Post Op.	Improved but B.C. C. persisted.
	No Cure	
" 54	Decapsulation of Kidney and then Post Op. Vaccines	Nothing of any effect.

OPINIONS AS TO VACCINE TREATMENT IN B.C.C. INFECTIONS.

English Authorities.

Rolleston testifies to their value.

Dudgeon testifies that they do symptoms good but do not influence Bacterimia.

Ross. In acute cases complete recovery.
In chronic cases, considerable improvement, but Bacteriwia persisted.

Horder says Vaccines are a valuable method in combating cases of B.C.C. infection, but there are other factors which help.

Routh testifies to the value of Vaccine in Acute Pregnancy Pyelo-nephritis, which secured normal Parturition and Puerperium. Bacteria persisted, pus disappeared.

Crowe, Yelverton, Devon, is of opinion that Vaccines are of great value in B.C.C. infections. In his paper, "A Series of One thousand Inoculations in Private Practice," he notes that four out of five of his cases improved, but he gives no note as to persistence of infection. In one case he states that she relapses, but always improves under Vaccine Treatment more than ordinary. medical methods.

Newman thinks Vaccines are of use in milder infections.

Lawson also reports a good result in Eye Cases.

ENGLISH Authorities Disappointed with Results.

Mose was disappointed with their effect in children.

Herringham ~~operates~~ treats with considerable reserve.

Napier Burnett is also disappointed with Vaccine Therapy.

AMERICAN AUTHORITIES.

Rovseny (Journal Am. Med. Ass., July 24,1909, 12 Cases of B.C.C. Pyelitis) expresses his surprise at the very valuable result he obtained, especially in cases where all other treatment failed.

Geraghty reports that Autogenous vaccines have a definite place as a therapeutic agent in urinary disease.

Hartwell, Streeter and Green report - That Bacterial Vaccines should be further employed in puerperal infections, which do not respond to ordinary treatment.
That bacterial vaccines are of much value in that type of sepsis which remains stationary for some time, as illustrated by a few of our septic laparotomy wounds etc.
That in remainder of cases, Vaccines are not of much help.

G.S. Marks instead of a vaccine uses an emulsion of 500 per c.c. of fluid, especially in Prostatic cases. He finds this of great value, especially in post operative pus tube cases .

Billing (New York State Journal of Medicine, 1910) has had excellent results from autogenous vaccines in infections of the Urinary tract with B.C.C.
While improvement may occur in all cases, a complete cure of the bacilluria will not usually be obtained.

Wulff (Presse Med. Feb. 9, 1910) is impressed with the value of Vaccine treatment in infections of the urinary tract with B.C.C. Out of 23 cases treated he had 18 successes, either absolute cure, or a great improvement in general condition.

J. O. Polak Vaccines are useful in all cases of puerperal infection, where the natural forces are incompetent, to produce an individual resistance sufficient to overcome the infection, and they are a valuable addition to our therapeutic resources. Vaccine therapy has a definite place in the Puerperal and septic infection in the sub-acute stage, and after the local focus has formed, it hastens convalescence.

Hugh Cabot — The use of vaccines is followed by improvement in more than half of the cases.
Vaccines have little effect on the Bacteriuria.
The results are the same whether the lesion is in the upper or the lower urinary tract.

Cunningham — B. Coli infections are amenable to treatment with B.C.C. Vaccines even when this infection is associated with Tuberculosis, as evidenced by diminution in symptoms of frequent urinations, pain and degree of cloudiness of the urine.
A predominating infection of the bladder and renal pelvis of long duration may temporarily improve during the use of Vaccine, but it has not any permanent effect.

Hartwell and Streeter — In cases in which but a moderate degree of bladder infection existed, vaccines produced amelioration and relief of symptoms.
(2) In some cases it seemed as if Vaccines gave more relief than ordinary measures. As an agency for diminishing pus in urine they are not dependable.
(3) Vaccines had no influence on Bacteriuria.
(4) Vaccines are efficient in mild forms of Cystitis.

AMERICAN AUTHORS DISAPPOINTED WITH RESULTS.

Geraghty — Twelve cases of pure B.C.C. and mixed infection all failed to respond to Vaccine treatment.

R.F. O'Neil — In Chronic Pyelitis and Pyelo-Nephritis Vaccines have proved unavailing.
In long-standing infections they fail to clear up the urine. Can have no effect in cases with gross alterations of structure.

Hugh Cabot — In 11 cases out of 19 reported That there was no definite or permanent relief, though many cases showed transient relief. Vaccines have little effect on Bacilluria.

J.H. Cunningham. A predominating infection of bladder and renal pelvis of long duration may temporarily improve during the use of Vaccines, but it has not had any permanent effect.

Hartwell and Streeter As an agent for diminishing pus in urine Vaccines are not dependable.
Vaccines had no influence on Bacteriuria.
They are without value in severe forms of Cystitis.

My personal experience of Vaccines is disappointing. In 7 out of the 10 cases that I have been able to watch and which are recorded in this paper, there was temporary improvement but no permanent relief, and bacilluria soon increased in numbers if they were at all diminished at any date. All these cases were also having ordinary Urinary antiseptics etc. at the same time as being given Vaccine, hence the results may be as much due to ordinary remedies as to the Vaccines.

Three of my ten cases were treated on usual lines.

Author's cases are 108, 109, 110, 111, 115, 118, 122, 130, 131, 132.

VACCINE DOSAGE.

Dose 3 to 5 million is the dose advocated by Dr. Crowe of Yelverton. He thinks bad effects are due to too large a dose.

Others use much larger doses, i.e. 10, 20 and 30 up to 60 million and 200 million. The highest dose in this paper was about 500 million. Doses progressively increased from time to time and given at intervals of 7 to 10 days.

In my seven cases the dose was 30 to 60 million. The Medical Annual, 1910, gives the dose of Vaccine as, Adults, 5 - 10 millions, children, 2 - 5 millions.

Dr. Crowe states that if there is a pronounced reaction with symptoms one can cut this process short by repeating half the dose of vaccine previously given within 24 - 48 hours of giving the first dose which produced the symptoms, and not waiting until the usual period (i.e. 7 - 10 days) has elapsed, before giving the next dose.

My personal opinion of Vaccine Therapy has not been large enough to enable me to say whether some of the disagreeable effects of a reaction can be thus cut short.

OTHER METHODS OF TREATMENT ADVOCATED ARE:-

(1) Use of a Polyvalent Anti-Bacillus Coli Serum has been recommended and employed with success by Dudgeon, but others have not found this successful.

Give 25 c.c. spread over 72 hours, combined with Calcium Lactate to avoid rashes and joint pains. Dudgeon records 12 cases so treated with good results.

Garnett Wright also advocates this method as a preliminary before going on to more serious operative procedure.

Harrar advocates

(2) Use of Magnesium Sulphate by Venous injection, in cases of General Peritonitis due to B.C.C. and other organisms. He quotes a case of Streptococcal infection so treated.

Meltzer is the author of this treatment: he advocates 12 ounces of a 1 per cent Mag. Sulph. to be run in under the breast. Harrar records that in two days after injection, temperature which was 105° fell to normal and only rose once again. Lochia which previous to injection was scanty, now became profuse and purulent. Patient discharged in good condition the 30th day of Puerperium.

He also advocates that in B.C.C. infection of Puerperal mucosa of Uterus, the gently given intra-uterine douche of saline is of great value.

This I have also been able to prove. In more serious Puerperal infection the Intra-uterine douche may be positively hurtful. (This point has been referred to elsewhere.)

SURGICAL METHODS OF TREATMENT.

Rolleston advocates these in -

(1) Chronic cases in which Pyelo-nephrosis has developed.

(2) In secondary cases in which there are calculi in kidney.

Burnett advocates emptying the Uterus in cases of severe Preganacy Pyelonephritis,

(2) Nephrectomy, producing a renal fistula in the loin.

Personally I would like to support Napier Burnett's view that in Pregnancy Pyelitis with serious symptoms, pregnancy should be terminated. In six of these cases of which I had experience, three of them when Abortion or miscarriage occurred exhibited a sudden relief of symptoms, i.e. fall of temperature, relief of pain etc., which was remarkable, and in the other three cases rupturing the membrane to induce abortion was deemed the best procedure in the interest of the patient. As the notes of these cases are not to hand I have not included them in the list quoted. No bad results followed, and all the above patients made a rapid convalescence. In future should I have a serious case of Pregnancy Pyelitis I shall not hesitate after consultation to terminate the pregnancy if other methods of medical treatment be unavailing.

Brewer regards Pyelo-nephritis as so serious that he thinks that immediate nephrectomy is advisable, being led to this conclusion by the high mortality which followed simple nephrotomy and drainage.

Frenchdoubts whether operative procedure was of value in a case when the kidney was exposed and seen to be studded with small abscesses: this was drained and patient recovered. Noteworthy that urine came away from wound 14 days after operation. This shewed there was some drainage of the kidney.

Garnett Wright advocates drainage of the kidney by Nephrotomy and if necessary Nephrectomy. Advantages of Nephrectomy are the rapid cure which follows, with healing of the wound and lower mortality. But on the other hand, although convalescence after Nephrotomy and drainage is prolonged, the patient is subsequently left with two kidneys instead of one.

Billing (New York State Journal of Medicine, 1910) advises surgical or mechanical measures where there is stagnation anywhere in the urinary tract, to correct anatomical faults which interfere with the proper drainage of the urinary tract.

LIST OF DRUGS MENTIONED AS HAVING BEEN USED IN THIS THESIS.

Drugs in Acid Urine.

Alkalis of all kinds

Potassium Citrate 30–40 grains every 3 hours (up to

Sodium Citrate 30-40 grains three times a day

Sodium Bicarbonate 30-37 three times a day

Sodium Salicylate has also been found useful in Pyelitis of children when added to Pot. Citrate.

Urotropin, grs X

Helmetol grs X

In Alkaline Urine

Boric Acid, grs V – X

Acid Sodium Phosphate 37 three times a day and then

Sodium Benzoate

Napthol

For relief of pain

Asperin, grs V

Chloral

Potassium Bromide

Chloral

Hyoscyamus

Morphia, in great severity of pain.

Alimentary Antiseptics.

Salol

Napthol

Calomel

Mild Laxatives

Copper Sulphate is also used in America.

Diuretics

Also Proposole (a combination of Creosote + Phenyl Propionate) (Park Davis)

Theocin

Diuretin

Tinct. Digitalis

Caffeine Citrates

Irrigations, Douches etc.

Sterile Water

Saline solution

Boric Acid Lotion

Pot. Permanganate

Silver nitrate in varying strength, 1 or 2 grs per to grs X per

Carbolic Acid, weak solution

Silver Preparation.

Argyid

Protoizol

Special Solutions

Magnesium Sulphate 1 % solution under the breast, or intravenous, as recommended by Meltzer and Harrar. In general infections.

Normal Saline under breast or intravenous in general infections.

A SUMMARY OF CONCLUSIONS.

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(1) That the Bacillus Coli Communis is a pathogenic organism, and is the cause of a specific disease which may be clinically demonstrated and should be described as a Bacillus Coli Infection, i.e. Toxemia Septicemia.

(2) Many Clinical Diseases at present described as separate entities are probably phases of the same infection.

(3) The main incidence of this infection falls upon the Genito-Urinary tract.

Such lesions as Pyelitis, Nephritis of all varieties, Cystitis and many kinds of Bladder disease are frequently due to this organism, either when it is the predominating organism or in association with other organisms such as the Staphylococcus, Streptococcus and gonococcus etc.

(4). Alimentary Disturbances such as Enteritis, Diarrhoea, Colitis etc. are often an antecedent to the appearance of B.C.C. in the urine and producing symptoms of Acute Pyelitis, Cystitis etc.

(5) The abraded or wounded mucosa of the Intestinal Wall permits of the escape of the B.C.C. from the bowel lumen into the lymphatic system and thence into the general blood system. A healthy mucosa will not permit the escape of B.C.C.

(6) The B.C.C. infection in the blood stream may produce a general Septicemia, though this is comparatively rare, but a sufficient number of cases are on record to prove its possibility. B.C.C. has been cultured from the living blood.

(7) The B.C.C. may produce a severe toxemia which may affect the Nervous System and the special Sense Organs. Such are exemplified by the Failure of Vision in three of the cases of Eye trouble quoted. In these cases there were no genito-urinary symptoms, though there was evidence of toxemia and B.C.C. was present in urine.

(8) The symptoms of B.C.C. infection should be especially watched for during Pregnancy, and during the Puerperium, as Pyelitis may develope, and the case may be diagnosed as Puerperal Fever. Also in unexplained High Fevers of Children.

(9) Suggested as a possible cause of Rheumatoid Arthritis.

(9a) It is noteworthy that in many cases of Chronic suppuration due especially to Tubercle, with use of Tuberculin a great improvement is obtained, but final healing may be delayed, and then it is found that B.C.C. is also present. If Tuberculin and B.C.C. Vaccine be given then the lesions heal up. This has been especially noted in Skin lesions such as Lupus Vulgaris.

(9b) In all operative procedure upon the Peritoneal cavity, where there has been a history of any prolonged constipation, or if there is found at the operation many adhesions to intestines and especially in the region of the Rectum, an acute Pyelitis may either be relighted or develope for the first time; the symptoms being vomiting, and high temperature with renal pain; and on examination of the urine there will be found the usual characteristics of a Bacilluria and Pyuria.

(10) Method of Infection. Most frequently Haematogenous.
Sometimes Ureogenous.
Least often Transparietal.

(11) Origin of the B.C.C. This is very difficult to give de novo, as it is found to exist universally, and has been found not only as a habitat of the mammalian species, but has also been found in trees and plants, and a suggestion has been made that it may cause diseases in plants which are communicable to the human being.

(12) The Treatment.

(a) By drugs, i.e. Urotropin, Helmetol, Boracic acid, Copper Sulphate and Alkalis such as Pot. Acetate and Pot. Citrate and Urinary Sedatives.

By Alimentary Disinfectants such as Salol, Napthol, Hyd[illegible] Subchloride etc.

By Local Measures, Bladder and Bowel Irrigations, and even irrigations of Pelvis of Kidneys (for Experts).

(b) Vaccine Therapy has a place in treatment.

Some cases have been definitely cured, and many cases are reported as having obtained greater and more permanent relief than with ordinary medical treatment.

Where permanent structures were in a gross pathological state no medical treatment will avail.

Use of Acute Bacillus Coli Serum ~~surgery~~ has some advocates.

(c) Surgery in some cases gave relief by removing a large focus of Bacilluria and after a mixed infection. Such cases required Nephrectomy, Nephrosis, Cystotomy etc. There are some cases in which neither Medicine nor Surgery avail.

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Clinical Symptoms and Treatment,

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